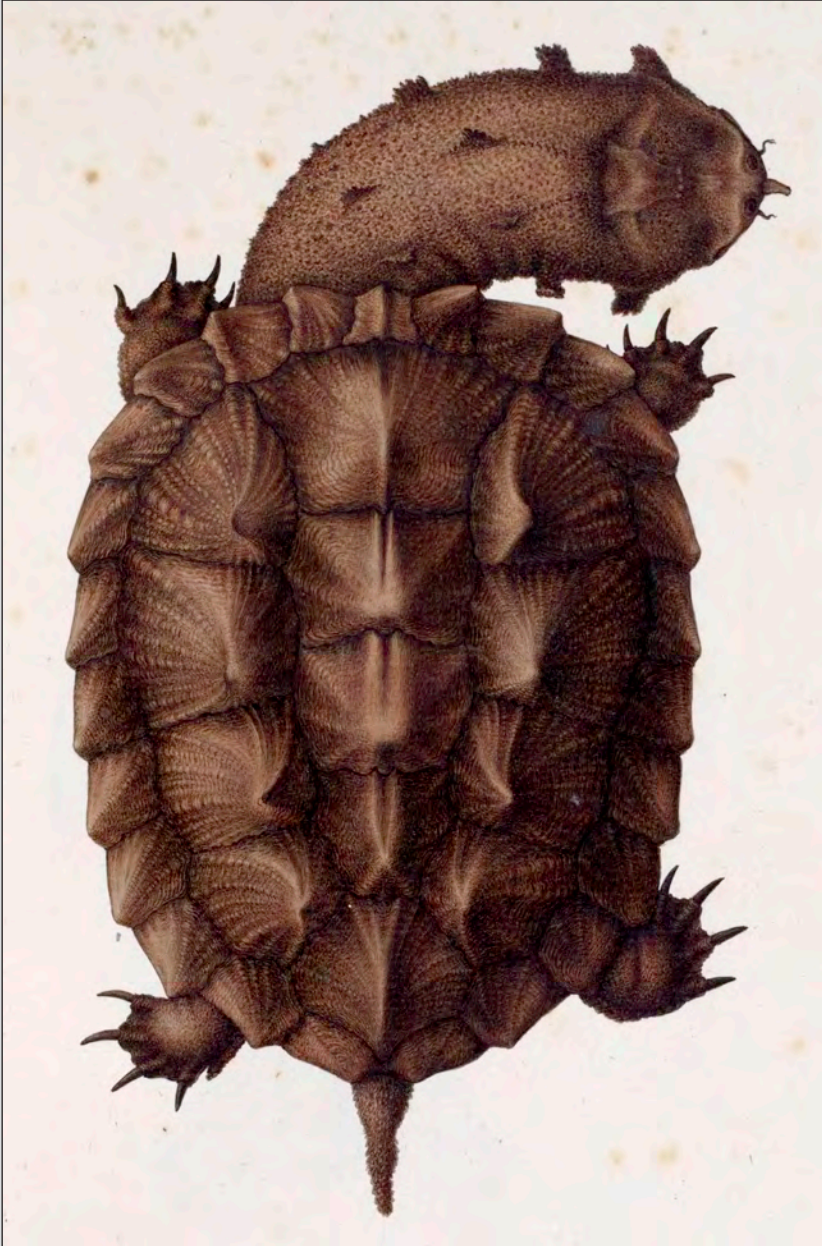


# Bibliotheca Herpetologica

A Journal of the History and Bibliography of Herpetology



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International Society for the History and Bibliography of Herpetology



### The Society

The **ISHBH** is a not-for-profit organization established to bring together individuals for whom the history and bibliography of herpetology is appealing, to promote the knowledge of related topics among members and the general public, and to promote research. Membership is open to anyone who shares the aims of the Society.

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Regular membership for 2016–2017 is US \$45, Sponsoring US \$75, Institutions US \$75, and Benefactor US \$150. The present two-year period covers *Bibliotheca Herpetologica* volumes 13 and 14. Life Membership is US \$450 starting from 2016, but will also include volumes 9, 10 and 11 (while stock lasts). A membership application form that includes the possibility to order back issues can be found on our website. Payment can be made by personal check or money order in USD drawn on a US bank sent to the Secretary-Treasurer or the Chairperson. Payment can also be made by transfer in euro to Plusgirot, Sweden, IBAN SE83 9500 0099 6042 0455 1206, BIC NDEASESS. Payment by credit card can be made by PayPal to our email [ishbh@live.com](mailto:ishbh@live.com).

Members are encouraged to contribute with articles, essays, news of meetings, hints on antiquarian trade, book reviews and other issues associated with herpetology. The Society organizes seminars, visits to libraries, museums, etc. in connection with herpetological meetings with international participation. The Society works to facilitate informal contacts among members so that the members can meet, offer support in knowledge and transact exchanges of literature.

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## Society News

### MESSAGE FROM THE CHAIRMAN

It is exciting as a Chairman to finally introduce this issue of *Bibliotheca Herpetologica* filled with significant information in herpetology on manuscripts and literature of the 18<sup>th</sup> and 19<sup>th</sup> centuries. I wrote finally because the journal copy is actually to be assigned to the first year of the current combined membership period 2016 and 2017 and combining Nos. 1 and 2 in one extra stout volume. Next issue is due before long, so if you haven't paid for the current period, please do so now in order to secure also the forthcoming installments of *Bibliotheca Herpetologica*. Easiest is to take advantage of the secure PayPal service and pay to our e-mail address: [ishbh@live.com](mailto:ishbh@live.com). If you are unsure of your membership status, please inquire with the officers on the same e-mail.

### The Society Meetings 2017 and 2018

The 2017 ISHBH business meeting took place in Austin, Texas, USA with the JMIH on July 15 and, as is tradition, held with a shared luncheon and classically was filled with fascinating conversations on subjects related to the history and bibliography of herpetology (see photo below). The financial statement for 2016 showing a turnover of \$2,304, a net profit of \$99 and equity, including the gain, of \$1,126 was approved. We can welcome as the elected new treasurer/secretary Dr. Thomas Håkansson from Lexington, Kentucky, an anthropologist and part-time herpetologist. The other officers of the board were re-elected for various periods, but none for more than two years. A minor update to the Society's constitution, which was endorsed on June 27, 1999, was approved, but to be ratified at next year's

business meeting before it takes effect. For details, please refer to our website. The Society Meeting 2018 is planned for mid-July in Rochester, New York, USA together with the JMIH. Please mark your calendar already now.

**Richard Wahlgren**

### ABOUT THE COVER

The Matamata, *Chelus fimbriatus* (Schneider, 1783), is undoubtedly one of the most peculiar hard-shelled extant species of turtles. The cover of this issue of *Bibliotheca Herpetologica* shows one of the earliest illustrations of this remarkable South American pleurodire. It originally was intended to accompany a formal description of this species under the name "*Testudo torticollis*" by Alexandre Rodrigues Ferreira (1756–1815) that was never published. The watercolor currently is deposited in the Arquivo Histórico do Museu Bocage of the Museu Nacional de História Natural e da Ciência in Lisbon, Portugal (MUHNAC/AHMB/ARF/Watercolors). Luis Ceriaco and Aaron Bauer introduce us to Ferreira's original manuscript description of "*Testudo torticollis*," this watercolor and several other early illustrations of the Matamata.

**Markus Lambertz**



The 2017 ISHBH business meeting, from left to right: Greg Watkins-Colwell, Jonathan Bynum, Erin Chapman, Aaron Bauer, John Moriarty, Joe Mitchell, Richard Wahlgren, and Luis Ceriaco.

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# Carl Bernhard Brühl and the Herpetological Contributions of his *Zootomie aller Thierklassen*

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**Abstract.** Carl Bernhard Brühl was a prominent and prolific morphologist in the middle part of the 19th century who specialized in comparative osteology and brain structure. His work is notable especially for the exquisite and painstakingly detailed illustrations that accompany his descriptions. His early anatomical work on crocodilians and turtles (along with bony fishes and mammals) paved the way for the assembly of a multi-part treatise (*Zootomie aller Thierklassen*) that complimented his public lectures on comparative anatomy and provided a vehicle for presenting the details of animal structure to the public at large. Published in 40 (of an intended 50) parts (Lieferungen) between 1874 and 1888, the *Zootomie aller Thierklassen* is rich in herpetological examples. More than 40% of the plates and accompanying text are devoted to the anatomy of amphibians and reptiles. Although some of the illustrations are adapted from those occurring in previous publications (mostly those of Brühl himself), the majority appear in the *Zootomie aller Thierklassen* for the first time. The rather erratic publishing schedule of this multi-part work, the unpredictable occurrence and content of each Lieferung, and the relative obscurity of the complete work has led to its content being generally overlooked (especially beyond the German-speaking world). Citations after the close of the 19th century are few. We herein provide an overview of the *Zootomie aller Thierklassen*, with a complete listing of the amphibian and reptile taxa (at least 70 species) examined and illustrated by Brühl, and a breakdown of the particular Lieferungen that include herpetological material. For those concerned with the skeletal anatomy of amphibians and reptiles, the *Zootomie aller Thierklassen* provides a wealth of detail that should be consulted for both information content and for priority of observation.

## INTRODUCTION – ANATOMY IN 19TH CENTURY GERMANY

The study of morphology underwent major changes throughout the 19th century, in parallel with changes in the development of biology as the scholarly exploration of life. There were essentially three phases of research on animal morphology throughout the century (Russell 1916). In its early part, during which Johann Wolfgang Goethe first dubbed the study of organismal form as morphology (Nyhart 1995; Singer 1959), a transcendental approach was carried over from the previous century. In the second half of the 19th century this was gradually replaced by an evolutionary approach (championed by scholars such as Ernst Haeckel and Carl Gegenbaur), which emphasized phylogenetic trees and employed the methods of comparative anatomy to try to explain form (Nyhart 1995). This, in turn,

was overshadowed in the latter part of the century by a causal approach to morphology that integrated experimental embryology (as popularized by Wilhelm Roux). Collectively these changes indicate a transition from “structural” to “functional” morphology as the century progressed (Singer 1959). The idea of purpose as sufficient explanation of both organic structure and the succession of life through geological time, commonly held by morphologists at the beginning of the 19th century (Ospovat 1978), gave way to a nascent non-teleological interpretation of form by its end. Even so, morphology as a whole was not particularly successful in the assimilation of evolutionary ideas into its *modus operandi* (Ghiselin 1980).

One of the most important anatomists of this transitional period, whose research program aligned most closely with the pre-evolutionary rationale for studying form, was Carl Bernhard Brühl (May



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5, 1820–August 14, 1899; Figure 1). In this paper we consider the many contributions made by Brühl to science, but most particularly his exquisitely detailed anatomical illustrations of amphibians and reptiles as published in *Zootomie aller Thierklassen*, his *magnum opus*.

In the German-speaking academic community of central Europe the study of form was a prominent part of the university curriculum throughout the 19th century (Nyhart 1995). Beginning with morphologists like Friedrich Tiedemann, Johann Friedrich Meckel, and later Johannes Müller, in the first half of the century, strong academic traditions in morphology were established at leading institutions. Although by the start of the 19th century pure descriptive morphology of individual species had largely served its purpose of revealing the major variations of animal “design” (Cole 1949; Ghiselin 1980), it continued as a research stream embedded within other disciplines, particularly those of anatomy and zoology. Anatomy employed morphology in what was seen to be a more medically relevant way, whereas zoological morphologists developed the area of zootomy, studying animal anatomy for its own sake. Within this latter context, the mid- to late 19th century saw the flourishing of comparative vertebrate anatomy. Among biologists, zoological morphologists became strongly associated with the teaching-focused concept of *Bildung*, arguing for the value of pure science as a tool for stimulating the imagination of the student, rather than seeking to justify their pursuits through the development of practical skills (Rathke 1833; Nyhart 1995). Such practitioners justified their research through the perceived value of pure science (*Wissenschaft*), an approach that did not require inferences beyond those related to how the inner history of nature could be revealed by the study of structure and form (Sloan 1992). It was within this tradition of morphology that Carl Brühl contributed. His main active zoological anatomical publishing period spanned from 1845 to 1872 (see the partial bibliography of Brühl elsewhere in this paper), with the *Zootomie aller Thierklassen für Lernende, nach Autopsien, skizzirt* being published after this (1874–1888).



**FIGURE 1.** Lithograph of Carl Bernhard Brühl (ca. 1855) by August Strixner. Note that Brühl signed his name as Bern. Carl Brühl.

Morphologists in the German-speaking parts of Europe through the 19th century have been clustered into overlapping generational sets, with members of sets active at any given time reacting somewhat differently to the introduction of new ideas and techniques (Nyhart 1995). Of these sets (Nyhart 1995: Table 1.1), Brühl was trained and influenced by the cohort active in the 1830s to 1850s, characterized by such morphologists as Heinrich Georg Bronn, Johannes Müller and Karl Ernst von Baer, who built and expanded morphological and physiological research within the universities (especially in medical facilities). Brühl himself belongs to the cohort actively publishing from the 1840s to 1870, whose luminaries included Albert von Kölliker, Franz Leydig, Julius Victor Carus and Rudolf Virchow. This group was active during the period in which life-science research programs fragmented, and experienced the splitting of physiology from morphology, with the latter largely being subsumed within the disciplines of anatomy and zoology. The cohort active from the 1860s to the 1890s, led by such protagonists as Wilhelm His, August Weismann and

Ernst Haeckel, moved morphology into its next phase, that of Darwinization. This cluster, in turn, was overlapped by those morphologists actively publishing from the 1870s to the 1910s, including Max Fürbringer, Wilhelm Roux and Carl Rabl, who expanded Darwinian approaches to the study of animal form and introduced experimental investigations. Brühl's *Zootomie* was published during the time in which these latter two cohorts were active. Its contents, however, represent attention to detail of anatomical structure rather than the more "applied" areas of morphological research that were in vogue at the time, and are a clear reflection of his earlier work and the intellectual milieu in which it was conducted. It is also evident that his commitment to *Bildung* was served by his approach to morphology as a source of stimulation of the imagination of his students.

Brühl was seemingly one of the many animal morphologists for whom the evolutionary perspective made little difference in terms of the interpretation of organic form, even though he was a Darwinist. He was already steeped in a long-established morphological tradition when Darwin's *Origin* was published, and this school continued to use the principle of connections (topological correspondence) and the principle of correlation of parts (Cuvier 1798) to understand design (Lauder 1982). To these zootomists the diversity of form was indicative of a unity of plan as revealed in anatomical construction. For them, attention to the detail of structure was paramount, and it is in this regard that Brühl's contributions are particularly remarkable, especially his meticulous illustrations. From a herpetological perspective, the sheer variety of forms studied renders his contributions unique, but the publication of most of them solely in the *Zootomie*, with its relatively limited distribution and its appearance over many years, part by part, with no necessary consistency of included taxa from one part to the next, has resulted in most of his herpetological anatomical contributions being largely overlooked (see Tables for information about the taxa investigated and the dates of publication of various aspects of their morphology). Indeed, Adler (1989) mentions Brühl only in passing in describing the career of Friedrich Siebenrock (1853–1925; Figure 2). Brühl directly influenced Siebenrock, who served

under him as demonstrator in the Institut für Zootomie in Vienna (Tiedemann and Grillitsch 1989). Siebenrock's many contributions to the osteology of lizards (1892, 1893a, 1894, 1895a,b), *Sphenodon* (1893b), and turtles (1897, 1899) are more well-known to herpetologists today, but are the clear descendants of Brühl's work.

## THE LIFE AND WORKS OF CARL BERNHARD BRÜHL

One of the leading "scientific zoologists" (Nyhart 1995) of the mid-19<sup>th</sup> century, Carl Bernhard Brühl was Born in Prague, then part of the Austro-Hungarian Empire. He studied medicine first in Prague and then in Vienna during the period 1841–1847 (Meissner 1884), obtaining the degree of "Doktor der Medizin" in 1847 and that of "Magister Medicinae Veterinariae" in 1850. In the spring of 1848, when nationalistic and liberal revolutionary movements threatened the conservative and Germano-centric Habsburg Empire, Brühl spoke out in favor of liberal causes and academic freedom. Along with the Austrian State Secretary for Education, Ernst Baron von Feuchtersleben (1806–1849), he conceived a plan for public education in the natural sciences, although it never came to fruition (Egglmaier 1987). He briefly practiced medicine in Vienna, but went on an extended study tour of Italy, England, and France for several years, returning to Vienna in 1855. He was eventually appointed as professor of Zoology and Comparative Anatomy at the Jagelonian University in Cracow (1857), and subsequently in Pest (1858). However, as Brühl was not able to speak Hungarian, he could not meet new requirements for professors to lecture in the local language (Buklijas 2016). In 1861 Brühl joined the Zoological Institute of the University of Vienna, which had been founded in 1849 by Rudolf Kner (1810–1869). In 1863 he established the Zootomisches Institut (Zootomical Institute) which was located first in a private house and later in the old "Rifle Factory" which housed a number of university institutes (Grobbe 1901). In addition to his main responsibilities at the University, in 1866 he served briefly as director of the Thiergarten am Schüttel (Salvini-Plawen and Mizzaro 1999), which began as a private zoological garden in 1863, but

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closed in 1866 due to unprofitability (Knauer 1893), although re-opening several years later.

In Vienna Brühl became known for his free public lectures (1863–1890) on a variety of scientific topics (including human and comparative anatomy and evolution) aimed at the working and middle classes, reflecting his commitment to *Bildung*. A deist, Brühl held his lectures on Sunday mornings so as to compete with Sunday Mass. These popular lecture series had as many as 1167 subscribers in a single year (Brühl 1897a) and included hands-on demonstrations (Buklijas 2010, 2016). Amongst many students, Brühl's lectures were attended in 1871 by Fidelis Alois Nussbaumer (1848–?), who studied and experienced synesthesia (Jewanski et al. 2013). and in 1873 by the young Sigmund Freud, who was supposedly influenced to pursue medicine rather than law (Jones 1953; Hermann 1974) by the reading and discussion of Goethe's essay "Die Natur." Brühl's lectures were mixed with left-leaning politics and he tried to resurrect his 1848 plans for an institute of natural science learning for the masses. Brühl's lectures were also open to women. He demonstrated the folly of the widespread belief (see for example, von Bischoff 1872) that the female brain was too small and thus structurally unsuited to the study of certain topics, including medicine. Brühl (1883a) published an article in which he demonstrated that the human female brain was not smaller than that of the male, and argued from this physical equality for mental and legal equality. For this reason Brühl was regarded as a champion of the nascent feminist movement.

Brühl also popularized anatomy, and especially osteology, through exhibits at the 1873 World Fair in Vienna and through lectures given at schools at the behest of the Ministry of Education (1871–1890). He retired in 1890 and his institute was taken over by Karl Grobben (1854–1945) and renamed as the "II. Zoologisches Institut" (Grobben 1901). He nonetheless continued lecturing privately, due to popular demand (Anonymous 1899; Buklijas 2010). Brühl spent his last years in Graz, Austria where he died on 14 August 1899. His contributions and stature were recognized by his position as a Corresponding Member of the Academy of Sciences, Cracow, and in 1869 he



**FIGURE 2.** Friedrich Siebenrock (1853–1925), Austrian herpetologist who served as demonstrator under Brühl at the Institut für Zootomie in the 1870s and early 1880s. Image in public domain.

was awarded an honorary "Doktor der Philosophie" degree by the University of Vienna.

Brühl published extensively in the weekly *Wiener Medizinische Wochenschrift*, contributing, from its first volume in 1851, the "Journal-Auszüge" column in which articles from other journals were summarized and/or translated, and from the second volume (1852) a section "Feuilleton aus Pest" (Serial from Pest) about the medical scene in that city (followed by similar contributions about Prague, Paris, and Italy). He also authored critical reviews of a diversity of medical books, and contributed many articles, both signed and unsigned, dealing with the medical profession in general, standards in academic medicine, and other topics. Indeed, he was broadly interested in science as a whole, as well as its relationship to culture and the arts (Anonymous 1899).

Brühl's research output was impressive, especially given the exquisite detail of many of his works. Although he published broadly in anatomy in general, his special areas of research were vertebrate osteology and brain anatomy. His brain research led him to conclusions about the female human brain and its intellectual potential that made him well-known in early feminist circles (see above). Indeed, Brühl's contributions were such that at





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Anatomically, Brühl's focus in the *Zootomie* was on osteology. Of the 1583 vertebrate figures in the work, 1393 (88%) deal with the skeleton. Even the extensive human myology illustrations actually show skeletons with origins and insertions indicated by lines, rather than actual muscle drawings. Mammalian brains, depicted in 130 figures on 17 plates, come in a distant second (Table 1). His interest in comparative brain anatomy is clearly linked to his work on the human brain and his argumentation, on anatomical grounds, for female equality (Brühl 1879, 1883b).

Herpetological subjects account for 35% of all the plates and more than 40% of all figures in the *Zootomie*. Thus, it stands as a substantial source for the descriptive anatomy, especially of the skeleton, of amphibians and reptiles. Throughout this paper we refer to Brühl's plates using Arabic numbers, although as published they were designated with Roman numerals. At least 70 different species are illustrated (Table 2). These include ten salamanders (Figure 6) and 14 frogs (Figure 7), with an emphasis on the carpus and tarsus of both groups as well as skulls of the urodeles. Among reptiles 24 different lizard species are illustrated (Figure 8) along with *Sphenodon punctatus* (Figure 9), four snake species (Figure 10), and seven crocodilians (Figures 11–12), the relevant plates featuring mostly the head skeleton, whereas the ten chelonians figured include illustrations of post-cranial as well as skull features (Figures 13–14).

*Zootomie* was planned to consist of 50 parts (Lieferungen), with 200 plates and a total of 4000 individual anatomical figures. Because it was issued in parts over such a long period, it is associated with some bibliographic confusion. Probably because institutional subscriptions may have lapsed, libraries today vary in the number of plates they claim for the work and the span of years over which it was published. In reality 160 plates (actually 158 plates as Brühl counted the two folding plates as two plates each, see below) were eventually published before the series ended (Wiesner 1899). The text accounts in the last published Lieferung all bear the date August 1888.

The complete work was bound in four volumes, with 10 Lieferungen per volume. Each part was



**FIGURE 5.** Front wrapper of Lieferung 17 (1880) from volume 2 of *Zootomie aller Thierklassen* (Brühl 1874–1888), Brühl's largest and most ambitious anatomical work.

issued in wrappers giving the Lieferung number and date (Figure 5), and each volume was provided with a title page listing the included Lieferungen and the date of the last of these. Bound in the first volume is an introduction that states that each Lieferung is to consist of 4 plates and four leaves of text. It is dated “Ende September 1874” and notes that the first three Lieferungen had been printed by that time and that future Lieferungen were to appear every second month. This ambitious publishing schedule would, if fulfilled, have resulted in the last of the planned Lieferungen (No. 50) being issued in July of 1881. The introduction consists of four unnumbered pages outlining the scope, organization, and goals of the work, as well as a folding table of general osteological abbreviations. Brühl's goal of a Lieferung every two months was not met, neither were his total of 50 Lieferungen, nor his limitation to four leaves of text per Lieferung (Table 3).

The work as a whole was published and sold by Alfred Hölder, the book dealer of the University of Vienna. The lithographic plates were printed

**TABLE 1.** Taxonomic and thematic contents of Brühl's *Zootomie aller Thierklassen*. Percentages may not sum to 100 due to rounding. Asterisks (\*) denote plates depicting figures of more than one taxonomic group. The plates are indicated by Arabic numbers, not the Roman numerals used by Brühl.

Taxon (Total plates/Figures)	Structures	Plate Numbers	No. of Pls./Figs.	Percent Pls./Figs
<b>Mollusca (14/132)</b>				<b>8.8/6.9</b>
Gastropoda	Brain	40	1/7	
	Viscera	156–160	5/55	
Cephalopoda	Viscera	81–88	8/70	
<b>Arthropoda (13/191)</b>				<b>8.1/10.0</b>
Insecta	Oral apparatus	10, 104–105	3/59	
	Skeleton	102–103	2/41	
	Flea	101	1/10	
Crustacea	Skeleton	109–111	3/36	
	Oral apparatus	112–115	4/45	
Chordata: Vertebrata				
<b>Chondrichthyes (3/36)</b>				<b>1.9/1.9</b>
Holocephali	Skull and gills	65–67		
<b>Osteichthyes (20/240)</b>				<b>12.5/12.6</b>
Actinopterygii: Teleostei	Skull and gills	1–3, 5, 89–94		
	Skeleton	19/20, 24, 131–132	5/49	
<i>Amia/Lepisosteus/Hydrocyon</i>	Skull	18	1/16	
Sarcopterygii: Dipnoi	Skull	61–64	4/54	
<b>Amphibia (10/144)</b>				<b>6.2/7.6</b>
Urodela	Skull	7–8	2/18	
	Carpus	22–23	2/24	
	Tarsus	26, 29	2/29	
Anura	Skull	12	1/14	
	Carpus	25	1/15	
	Tarsus	30	1/27	
	Skeleton	68	1/17	
<b>Reptilia (46/634)</b>				<b>28.8/33.2</b>
Chelonia	Skull	69–74	6/71	
	Carapace/Plastron	75–80	6/67	
	Forelimb skeleton	33	1/18	
	Hindlimb skeleton	34	1/10	
Reptilia: Rhynchocephalia	Skull	148, 149*	1.5/39	
Reptilia: Squamata: Lizards (incl. amphisbaenians)	Skull	4, 140–147, 149*, 150, 151	11.5/156	
	Skeleton	53/54	2/28	
	Heart	11*	0.5/4	
Reptilia: Squamata: Snakes	Skull	152–155	4/52	

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TABLE 1. <i>Continued ...</i>				
Taxon (Total plates/Figures)	Structures	Plate Numbers	No. of Pls./Figs.	Percent Pls./Figs
Reptilia: Crocodylia	Skull	6, 133–139	8/97	
	Vertebrae	95–96	2/44	
	Forelimb skeleton	31	1/18	
	Hindlimb skeleton	32	1/25	
	Heart	11*	0.5/5	
<b>Aves (5/80)</b>	Skull	21	1/12	<b>3.1/4.2</b>
	Skeleton	38–39	2/38	
	Ear	120	1/17	
	Digestive apparatus	9	1/13	
<b>Mammalia (49/451)</b>				<b>30.6/23.7</b>
Monotremata	Skeleton	13–17	5/65	
Eutheria	Skull	55–60	6/43	
	Vertebrae	106–108, 117–118	5/86	
	Skeleton	27–28	2/9	
	Locomotor apparatus	119, 121–130	11/95	
	Brain	41–52, 97–100, 116	17/130	
	Stomach	35–37	3/23	
<b>Grand Total (160/1908)</b>				

by L. Sommer et. Co. (the first 3 Lieferungen/12 plates, all published in 1874) and later (all remaining plates) by F. Köke. Only plates 2–5 and 21–24 do not bear the printer’s name. The text pages mostly lack any indication of the printer except for a few accounts up to plate 100, which indicate J.C. Fischer & Comp., and the text accompanying plates from 124 onward, which indicate Ch. Reisser & M. Werthner as the printer, although not in all cases. As planned, each Lieferung included four plates, except that folding plates were each counted as two: these are plates 19 & 20 showing the skeleton of *Cyprinus carpio*, and plates 53 & 54, the skeleton of *Uromastix spinifer* ([sic] *U. spinipes* = *U. aegyptia*) (Figure 15). Thus, Lieferungen 5 and 14 had only three plates each. In most cases, the plates (all of which, except those printed by Sommer plus plate 23, are dated) were printed in the same year in which the Lieferung in which they were included was published. However, this was not true for the later Lieferungen, in which plates printed the previous year were often included (Table 3).

The text accompanying the first Lieferung explained Brühl’s plan for *Zootomie* and what he hoped to accomplish. By preparing all his own illustrations he intended to ensure quality and uniformity in the representation of anatomical structures and to provide readers with an authoritative set of didactically useful illustrations. He saw the work as a continuation and culmination of the project he began early in his career (Brühl 1847b), acknowledged the preponderance of osteological material in the work, and hoped that his contributions in this area would help standardize osteological terminology. Throughout *Zootomie*, however, he tried to cover soft anatomy as well, so as to give a well-rounded view of comparative anatomy. Where possible it was his intention to present “typical” forms along with “atypical” ones, which would reflect the structural diversity of the groups he covered, and to the extent possible, he also wanted to illustrate ontogenetic change in structures. Although he planned to illustrate as much material at his disposal as possible, he also considered it especially important to illustrate taxa and structures that had not been

**TABLE 2.** Anatomical features of amphibians and reptiles illustrated in Brühl's *Zootomie aller Thierklassen* by taxon (Brühl's original name followed by current name, if determinable, bold and parenthetical). Note that current names assume that Brühl's identifications were correct, and in some cases this is doubtful. The plates are indicated by Arabic numbers, not the Roman numerals used by Brühl.

Taxon (Current name, if different)	Anatomical features (plate: figures)
<i>Salamandra maculata</i> ( <b><i>Salamandra salamandra</i></b> )	Skull: 7:1,8:1; Carpus: 22:1-3,9; Tarsus: 30:1-2
<i>Salamandra maculosa</i> ( <b><i>Salamandra salamandra</i></b> )	Tarsus: 26:1-3,9-10
<i>Cryptobranchus japonicas</i> ( <b><i>Andrias japonicus</i></b> )	Skull: 7:2,8:2; Carpus: 22:7; Tarsus: 26:7,11;29:10
<i>Triton</i> sp. ( <b><i>Triturus</i></b> or <b><i>Lissotriton</i></b> or <b><i>Ichthyosaura</i></b> )	Tarsus: 26:8
<i>Triton punctatus</i> ( <b><i>Lissotriton vulgaris</i></b> )	Skull: 7:3,8:3
<i>Triton taeniatus</i> ( <b><i>Lissotriton vulgaris</i></b> )	Carpus: 22:4-5,8; Tarsus: 26:4-6
<i>Menopoma alleganensis</i> ( <b><i>Cryptobranchus alleganiensis</i></b> )	Skull: 7:4,8:4; Carpus: 23:1-4; Tarsus: 29:3-4,11
<i>Amphiuma</i> sp.	Carpus: 23:6
<i>Amphiuma tridactylum</i>	Skull: 7:5,8:5; Tarsus: 29:2
<i>Siren intermedia</i>	Skull: 7:6,8:6; Carpus: 23:5
<i>Sireodon pisciformis</i> ( <b><i>Ambystoma mexicanum</i></b> )	Skull: 7:7,8:7; Carpus: 23:9-12; Tarsus: 29:15,18
<i>Proteus anguineus</i>	Skull: 7:8,8:8; Carpus: 23:7,8; Tarsus: 29:1,8
<i>Menobranchus lateralis</i> ( <b><i>Necturus maculosus</i></b> )	Skull: 7:9,8:9; Carpus: 23:13-15; Tarsus: 29:5-7,12
<i>Salamandrella keyserlingii</i>	Tarsus: 29:9,17
<i>Salamandrella</i> ( <i>Isodactylum</i> ) <i>Wosnessenskyi</i> ( <b><i>Salamandrella keyserlingii</i></b> )	Tarsus: 29:14
<i>Ranadon sibiricus</i>	Tarsus: 29:13,16
<i>Rana pipiens</i> ( <b><i>Lithobates pipiens</i></b> )	Skull: 12:1-14; Carpus: 25:1-2; Tarsus: 30:5-7,21; Forelimb: 68:3; Shoulder: 68:2-4,7; Hip: 68:6,12; Vertebrae: 68:1 addendum,5,8-11,13-17; Skeleton: 68:1
<i>Rana esculenta</i> ( <b><i>Pelophylax esculenta</i></b> )	Carpus: 25:3,7; Tarsus: 30:17,22,24
<i>Bufo cinereus</i> ( <b><i>Bufo bufo</i></b> )	Carpus: 25:4; Tarsus: 30:16,27
<i>Bufo agua</i> ( <b><i>Rhinella marina</i></b> )	Carpus: 25:8; Tarsus: 30:4,20
<i>Bufo vulgaris</i> ( <b><i>Bufo bufo</i></b> )	Carpus: 25:10
<i>Bufo biporcatus</i> ( <b><i>Ingerophrynus biporcatus</i></b> )	Tarsus: 30:23
<i>Bufo variabilis</i> ( <b><i>Bufotes variabilis</i></b> )	Tarsus: 30:26
<i>Hyla arborea</i>	Carpus: 25:5; Tarsus: 30:15
<i>Hyla cyanea</i> ( <b><i>Litoria caerulea</i></b> )	Carpus: 25:6
<i>Hyla palmate</i> ( <b><i>Hypsiboas boans</i></b> )	Tarsus: 30:18
<i>Phryniscus</i> sp. ( <b>uncertain</b> )	Carpus: 25:9
<i>Pipa Americana</i> ( <b><i>Pipa pipa</i></b> )	Carpus: 25:11
<i>Pipa dorsigera</i> ( <b><i>Pipa pipa</i></b> )	Tarsus: 30:3,11-12
<i>Ceratophrys dorsalis</i> [sic] ( <b><i>Ceratophrys aurita</i></b> )	Carpus: 25:12-13; Tarsus: 30:19
<i>Bombinator igneus</i> ( <b><i>Bombina bombina</i></b> )	Carpus: 2:14; Tarsus: 30:25
<i>Pelobates fuscus</i>	Carpus: 25:15; Tarsus: 10,13-14
<i>Uromastix spinifer</i> [sic] ( <b><i>Uromastix aegyptia</i></b> )	Skull: 4:1-17; Heart: 11:6,8
<i>Uromastix spinipes</i> ( <b><i>Uromastix aegyptia</i></b> )	Tarsus: 32:1,22,12,17,19,22; Forelimb: 31:16; Hind Limb: 32:1; Shoulder: 53/54:2-7,12,28; Hip: 53/54:8,16-17,21-22; Vertebrae: 53/54:9-11,13-15,17-20,23-27; Skeleton: 53/54:1



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<b>TABLE 2. Continued ...</b>	
<b>Taxon (Current name, if different)</b>	<b>Anatomical features (plate: figures)</b>
<i>Iguana tuberculata</i>	Skull: 144:1-11; Tarsus: 32:10; Forelimb: 31:1; Hind limb: 32:7
<i>Lacerta agilis</i>	Skull: 143; Forelimb: 31:2
<i>Lacerta viridis</i>	Skull: 142:1-12, 143:2-3,5,7-9, 12,14-16,19; Forelimb: 31:7; Hind Limb: 32:9
<i>Phrynosoma</i> sp.	Forelimb: 31:4; Hind Limb: 32:11
<i>Phrynosoma orbicularis</i> ( <i>Phrynosoma orbiculare</i> )	Skull: 150:6-9, 11-14,16-17
<i>Phrynosoma Harlesii</i> [sic] ( <i>Phrynosoma cornutum</i> )	Skull: 150:15
<i>Phrynosoma cornutum</i> [stated by Brühl to be <i>P. orbiculare</i> , but copied from Blanchard's figure of the former species]	Skull: 150:10
<i>Trachysaurus rugosus</i> ( <i>Tiliqua rugosa</i> )	Skull: 149:10,13-17,19; Forelimb: 31:5; Hind Limb: 32:6,14
<i>Platydactylus</i> sp. ( <b>uncertain gecko</b> )	Forelimb: 31:6; Hind Limb: 32:2
<i>Platydactylus muralis</i> ( <i>Tarentola mauritanica</i> )	Hind Limb: 32:8
<i>Platydactylus guttatus</i> ( <i>Gekko gekko</i> )	Skull: 150:18; Shoulder: 150:18; Vertebrae: 150:18
<i>Varanus</i> sp.	Forelimb: 31:8; Hind Limb: 32:3
<i>Basiliscus</i> sp.	Forelimb: 31:9
<i>Stellio</i> sp. (prob. <i>Laudakia</i> or <i>Paralaudakia</i> )	Forelimb: 31:10
<i>Chamaeleo vulgaris</i> ( <i>Chamaeleo chamaeleon</i> )	Tarsus: 32:18,25; Forelimb: 31:11,14-15,17-18; Hind Limb: 32:16,21
<i>Chamaeleo africanus</i>	Skull: 145:1-12, 146:2,4-5,7
<i>Chamaeleo parsoni</i> ( <i>Calumma parsonii</i> )	Skull: 146:1,3,6,8-11
<i>Seps</i> sp. (prob. <i>Chalcides</i> sp.)	Forelimb: 31:13
<i>Agama</i> sp.	Hind Limb: 32:5
<i>Monitor terrestris</i> ( <i>Varanus griseus</i> )	Hind Limb: 32:23
<i>Psammosaurus griseus</i> ( <i>Varanus griseus</i> )	Skull: 140:1-7, 141:1-8, 143:1,4,6,10-11,13,17-18; Tarsus: 32:24
<i>Ctenodon bimaculatum</i> ( <i>Anolis bimaculatus</i> )	Skull: 144:1S
<i>Podicnema teguixin</i> ( <i>Tupinambis teguixin</i> )	Skull: 144:2S
<i>Anguis fragilis</i>	Skull: 147:1-19
<i>Chamaeleopsis hernandesii</i> ( <i>Corytophanes hernandesii</i> )	Skull: 150:1-5
<i>Pseudopus Pallasii</i> ( <i>Pseudopus apodus</i> )	Skull: 151:2-7,9,13
<i>Amphisbaena alba</i>	Skull: 151:1,8,10-12,14-22
<i>Tropidonotus natrix</i> ( <i>Natrix natrix</i> )	Skull: 152:1-2,9, 153:8,10-12, 154:2,5,9;155:2,4,6,9
<i>Python bivittatus</i>	Skull: 152:3-8,10-14; 153:13-14; 154:3,6-7; 155:3,7-8,10-11
<i>Boa constrictor</i>	Skull: 153:1-3, 154:1, 155:1,5
<i>Crotalus horridus</i>	Skull: 153:4-7,9,15-18,154:4,8
<i>Hatteria punctate</i> ( <i>Sphenodon punctatus</i> )	Skull: 148:1-20 149:1-9,11-12,18
<i>Gavialosuchus schlegeli</i> [ <i>Gavialis schlegelii</i> in pl. 137] ( <i>Tomistoma schlegelii</i> )	Skull: 133:1-4, 7(part) 134:4; 137:2
<i>Alligator lucius</i> ( <i>Alligator mississippiensis</i> )	Skull: 6:1-13; Heart: 11:1-5,7,9; Forelimb: 31:12; Hind Limb: 32:4,13,15
<i>Aligator palpebrosus</i> ( <i>Paleosuchus palpebrosus</i> )	Skull: 6:15

TABLE 2. Continued ...

Taxon (Current name, if different)	Anatomical features (plate: figures)
<i>Gavialis gangeticus</i>	
[ <i>Crocodylus gangeticus</i> in pl. 139]	Skull: 133:5-6; 134:5, 7(part); 139:2
<i>Crocodylus</i> sp.	Forelimb: 31:3; Hind Limb: 32:20; Vertebrae: 96:7(part), 10 (part)
<i>Alligator sclerops</i> ( <i>Caiman crocodilus</i> )	Skull: 6:14; Vertebrae: 95:1-19; 96:1-6, 7(part), 8-9, 10 (part), 11-25
<i>Crocodylus acutus</i> ( <i>Crocodylus acutus</i> )	Skull: 133:7; 134:1-3, 6, 8-10; 137:3, 6
<i>Alligator mississippiensis</i>	Skull: 135:1-10; 136:1-10; 137:1, 4-5, 7-14; 138:2, 4-5, 9-10, 13, 16-18; 139:3-13
<i>Crocodylus niloticus</i> ( <i>Crocodylus niloticus</i> )	Skull: 138:1, 3, 6-8, 11-12, 14-15; 139:1
<i>Chelydra serpentina</i>	Forelimb: 33:1, 4; Hind Limb: 34:1, 6; Hip: 76:10; Carapace/Plastron: 77:13; 80:1, 3, 10; Vertebrae: 77:1; 3, 5, 9-10
<i>Testudo graeca</i>	Skull: 69:1-2; 70:1-2; 71:2, 4; 72:6, 9-11, 14; Forelimb: 33:2, 10, 17-18; Hind Limb: 34:2, 5; Hip: 34:2; 76:9; Carapace/Plastron: 78:1-4; 79:2-9, 11, 15
<i>Chelonia</i> sp. (uncertain cheloniid)	Carapace/Plastron: 80:8-9
<i>Chelonia cauwana</i> [sic] ( <i>Caretta caretta</i> )	Skull: 69:9-12; 70:9-11; 71:6; 72:3, 5, 7-8, 13; Forelimb: 33:3, 6, 12, 15; Hind Limb: 34:3; Carapace/Plastron: 77:18; 79:12; 80
<i>Cistudo virginiana</i> [ <i>Testudo virginiana</i> in pl. 34] ( <i>Terrapene carolina</i> )	Skull: 72:19; Forelimb: 33:5, 7, 11, 16; Hind Limb: 34:8
<i>Emys europaea</i> ( <i>Emys orbicularis</i> )	Skull: 69:3-4; 70:3-4; 71:1, 3; 72:15-16; Forelimb: 33:8, 14; Hind Limb: 3:4, 9; Carapace/Plastron: 77:8, 22-23; 79:1, 10, 16; 80:2, 7
<i>Trionyx aegyptiaca</i> ( <i>Trionyx triunguis</i> )	Skull: 69:5-6; 70:5-6; 71:7-8; 72:12, 20; Forelimb: 33:9, 13; Hind Limb: 34:7, 10; Carapace/Plastron: 77:15; 79:14; 80:4, 6
<i>Trionyx granulosus</i> ( <i>Lissemys punctata</i> )	Carapace/Plastron: 77:16
<i>Chelodina longicollis</i>	Skull: 69:7-8, 13; 70:7-8; 71:5; 72:1-2, 4, 17-18; Hyoid: 74:3, 7; Carapace/Plastron: 77:4; 80:5
<i>Chelus fimbriata</i> ( <i>Chelus fimbriatus</i> )	Skull: 73:1-7; 74:1-2, 4, 6, 8-12; Shoulder: 77:19; Hip: 76:4, 6, 8; Hyoid: 74:5-6, 8, 12; Carapace/Plastron: 75:1-4; 76:1-3, 5, 7; 77:2, 6; 79:13; Vertebrae: 77:7, 11-12, 14, 20-21
<i>Pentonyx capensis</i> ( <i>Pelomedusa galeata</i> )	Carapace/Plastron: 77:17

adequately figured before. As a Darwinist, Brühl saw comparative anatomy as tangible evidence for evolution, but this viewpoint is more implicit than explicit in most of the work. Significantly, given his lifelong commitment to public education, he was adamant that the *Zootomie* should be relatively inexpensive and thus available to anyone who wished to learn about anatomy.

The plates were drawn by Brühl himself, except in specific cases in which he copied figures from selected works. The text for all figures not copied from other sources includes the notation “Originalzeichnung.” Although the text cites a variety

of sources, Brühl avoided using the illustrations of others whenever possible. When he did so, they were often reversed (e.g., Pl. 22 Figs. 7, 14; presumably the result of copying the originals directly onto stone), or otherwise edited (e.g., Pl. 22, Fig. 2). In the case of the skulls of *Natrix natrix* taken from Parker (1879) he changed the number of teeth or removed them entirely. In total, his herpetological illustrations are borrowed from only sixteen sources: Cuvier (1812: pls. 77, 80), Bischoff (1836: pl. 11), Van der Hoeven (1846: pls. 7, 8, 23), Blanchard (1852–1856: pl. 150), D’Alton and Burmeister [as Burmeister] (1854: pl. 6), Calori (1861a: pl. 150, 1861b: pls. 31, 32,

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1861c: pl. 150), Gegenbaur (1864: pls. 23, 26, 29, 30, 31), Hyrtl (1865: pls. 23, 26, 29), Günther (1868: pl. 149), Rüttemeyer (1873: pl. 77), Hoffmann (1873–1878: pls. 22, 26), Born (1876: pls. 30, 31), Wiedersheim (1876: pl. 29) and Parker (1879: pl. 154, 155).

In addition to the sources from which illustrations were taken, Brühl, in the accompanying text, also cites works by other leading herpetologists and anatomists of his time, as well as those of the preceding generation, including Franz Leydig, Thomas Henry Huxley, Franz Steindachner, Richard Owen, Paul Gervais, Hermann Friedrich Stannius and Carl Joseph Windischmann. Accompanying text discusses differences between authors' terminology, refers to other species not figured, and considers such topics as the relationship of *Hatteria* (*Sphenodon*) to rhynchosaur, the embryology of skull bones, the reduction of the epipterygoid in chameleons, the respiration of crocodiles, the relationships of the turtle carapace to the ribs and to the overlying scutes and the homologies of the turtle shell, and sometimes discusses hypotheses, such as that concerning the archipterygium and its relationship to the origin of tetrapod limbs (Pl. 22).

The images on the lithographic plates are rendered as line drawings on a yellowish background, but some have a black background (pls. 22–23, 25–28; Figure 6). The brain plates (97–100 and 116) are on a white background. Only the last Lieferung, issued in 1888, has partly colored chromolithographic plates. Each plate is highly detailed, usually consisting of many figures. Plate 38, one of the bird skeleton compilations, sports the greatest number (29) of included figures. In general, however, the skull plates are the most complex, and most include many figures. Most plates provide a scale in reference to natural size.

The present whereabouts of the herpetological anatomical specimens that Brühl used is unknown. His collections were built from a variety of sources. Some were obtained from Josef Hyrtl, who taught anatomy at the University of Vienna Medical School, although these were given under duress as the two men were rivals with fundamentally different views of the meaning and value of anatomy (Buklijas 2016). Other material came from the

zoological gardens at Schönbrunn, the Kaiserlich-königliches Militär-Thierarznei-Institut (Imperial and Royal Military Veterinary Institute) and Brühl's limited field work on the Adriatic coast in Italy in 1863 (Buklijas 2016). Ultimately material from Brühl's Zootomical Institute was accessioned into the Natural History Museum in Vienna, but there is no indication that the material figured by Brühl formed part of this transfer, or if it was transferred, that it has survived to the present (Grillitsch et al. 1996, 2004). Specimens illustrated by Brühl are rarely identified in detail, but there are exceptions. For example, the carpus of a 29.5 cm *Menobranchus lateralis* (= *Necturus maculosus*) depicted in Fig. 15 of Plate 23 is identified as preparation "Nr. 3514 des Wien. Zootom. Univ.-Institutes."

There is some confusion associated with Brühl's publications, in part because several earlier works were subsequently reprinted much later, although without changes to content (Brühl 1887a,b, 1888b). In addition, a number of thematic sections of *Zootomie* were apparently issued separately (Brühl 1882, 1883a, 1885, 1886a,b, 1888a, 1891a,b,c,d). These correspond exactly to the number of plates and text pages in the relevant sections of *Zootomie*. However, we were unable to examine copies of most of these works and it is unclear whether some or all of these were issued with their own title pages or with the original Lieferung wrappers. Further evidence that portions of Brühl's *Zootomie aller Thierklassen* were marketed separately comes from *Naturae Novitates*. September 1899. Nr. 18. 529–552, the fortnightly book catalogue of R. Friedländer & Sohn, which ran a special listing of Brühl's available publications (p. 552; Figure 16) shortly after his death.

A search of WorldCat ([www.worldcat.org](http://www.worldcat.org)), a global database of research library collections, reveals about 37 institutional libraries possessing some or all of Brühl's *Zootomie*. A number of collections appear to have one or just a few Lieferungen of the work, whereas others have more complete holdings. Many entries, however, give only a single year of publication and others give an incomplete range of years (e.g., 1874–1883, 1877–1888). The confusion no doubt lies in the serial publication of the work, with some institutions citing dates from individual volume title

**TABLE 3.** Parts (Lieferungen) of *Zootomie aller Thierklassen* indicating the year of issue and included plate numbers (with associated number of text pages). Plate numbers underlined are herpetological in content and those indicated with an asterisk (\*) were printed the year previous to the publication year of the corresponding Lieferung. Plate 23 is undated. Content is listed for herpetological plates only and follows Brühl's titles for each plate. There is a correction slip bound in with the text to plate CXLIX correcting the geographic distribution of *Trachysaurus rugosus* (= *Tiliqua rugosa*) from America to Australia. The plates are indicated by Arabic numbers, not the Roman numerals used by Brühl.

Part	Year	Plates (text pages)	Herpetological content of <i>Zootomie aller Thierklassen</i>
1	1874	1(1), 2(1), 3(1), <u>4</u> (1)	4. Caput sauriorum, <i>Uromastix spinifer</i>
2	1874	5(1), <u>6</u> (1), <u>7</u> (1), <u>8</u> (1)	6. Caput sauriorum, <i>Alligator Lucius</i> [and other crocodylians] 7. Caput amphibiorum [Urodela, dorsal views] 8. Caput amphibiorum [Urodela, ventral views]
3	1874	9(2), 10(2), <u>11</u> (2), <u>12</u> (2)	11. Cor reptilium 12. Caput amphibiorum [Anura]
4	1875	13(2), 14(1), 15(2), 16(2)	
5	1875	17(2), 18(3), 19/20(2)	
6	1876	21*(2), <u>22</u> (2), <u>23</u> (2), 24*(2)	22. Carpus amphibiorum (Urodela 1) 23. Carpus amphibiorum (Urodela 2)
7	1876	<u>25</u> (2), <u>26</u> (2), 27(2), 28(2)	25. Carpus amphibiorum (Anura) 26. Tarsus amphibiorum (Urodela 1)
8	1877	<u>29</u> (3), <u>30</u> (4), <u>31</u> (3), <u>32</u> (3)	29. Tarsus amphibiorum (Urodela 2) 30. Tarsus amphibiorum (Anura)
9	1877	<u>33</u> (3), <u>34</u> (2), 35(4), 36(2)	33. Extremitas anterior reptilium (Saurii, Crocodilini) 34. Extremitas posterior reptilium (Saurii, Crocodilini)
10	1877	37(3), 38(4), 39(2), 40(3)	
11	1878	41(8), 42(2), 43(2), 44(2)	
12	1878	45(3), 46(1), 47(1), 48(1)	
13	1878	49(1), 50(1), 51(2), 52(1)	
14	1879	<u>53&amp;54</u> (4), 55(2), 56(2)	53&54. Sceleton reptilium (Saurii)
15	1879	57(2), 58(2), 59(3), 60(3)	
16	1880	61(4), 62(2), 63(2), 64(3)	
17	1880	65(3), 66(2), 67(2), <u>68</u> *(2)	68. Sceleton amphibiorum (Anura)
18	1880	<u>69</u> (3), <u>70</u> (2), <u>71</u> (2), <u>72</u> (3)	69. Caput reptilium Chelonii 70. Caput reptilium Chelonii 71. Caput reptilium Chelonii 72. Caput reptilium Chelonii
19	1880	<u>73</u> (2), <u>74</u> (2), <u>75</u> (2), <u>76</u> (2)	73. Caput reptilium Chelonii. <i>Chelus</i> (Matamata) 74. Caput et apparatus hyoideum reptilium (Chelonii: <i>Chelus</i> , Matamata; <i>Chelodina</i> ) 75. Truncus reptilium Chelonii: ( <i>Chelus</i> ) (Matamata) 76. Truncus et pelvis reptilium Chelonii: ( <i>Chelus</i> ) (Matamata)
20	1880	<u>77</u> (3), <u>78</u> (2), <u>79</u> (2), <u>80</u> (2)	77. Truncus reptilium plastron et vertebrae cervic. 1, I-VIII. Cheloniorum 78. Truncus reptilium carapax Cheloniorum 79. Truncus reptilium plastron et schemata diversa 80. Truncus reptilium carapax Cheloniorum
21	1881	81(4), 82(2), 83(3), 84(3)	
22	1881	85(4), 86(2), 87(2), 88(2)	
23	1881	89(2), 90(2), 91(3), 92(2)	
24	1881	93(4), 94(3), <u>95</u> (3), <u>96</u> (3)	95. Truncus reptilium vertebrae crocodiliorum. 1. <i>Alligator sclerops</i> 96. Truncus reptilium vertebrae crocodiliorum. 1. <i>Alligator sclerops</i>



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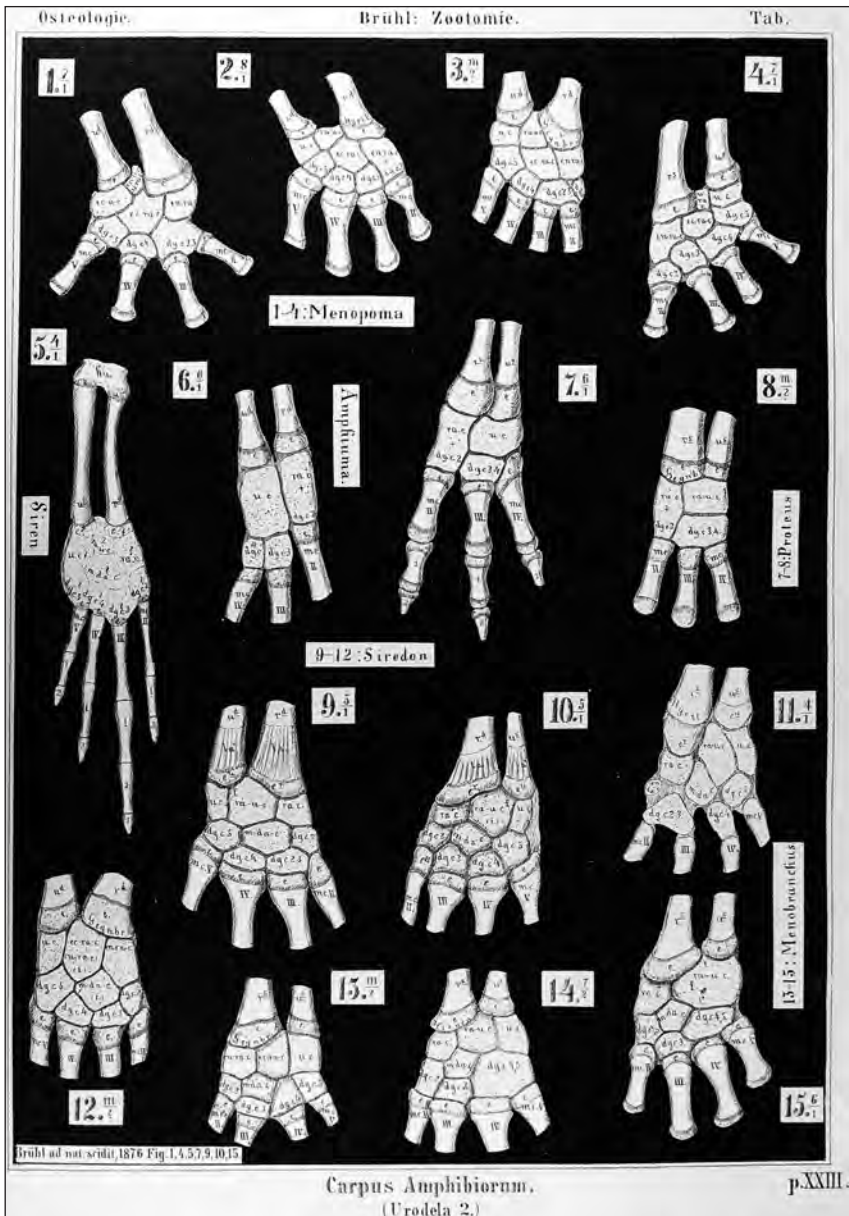
**TABLE 3.** *Continued ...*

Part	Year	Plates (text pages)	Herpetological content of <i>Zootomie aller Thierklassen</i>
25	1882	97(4), 98(3), 99(2), 100(2)	
26	1882	101(5), 102(4), 103(3), 104(4)	
27	1882	105(3), 106(3), 107(3), 108(3)	
28	1883	109(3), 110(3), 111(3), 112(2)	
29	1883	113(2), 114(2), 115(2), 116*(3)	
30	1883	117(2), 118(2), 119(3), 120(4)	
31	1884	121(3), 122(2), 123(2), 124(3)	
32	1884	125(4), 126(3), 127(3), 128(3)	
33	1884	129(3), 130(4), 131(3), 132(2)	
34	1886	<u>133</u> *(4), <u>134</u> *(3), <u>135</u> (6), <u>136</u> (5)	133. Caput reptilium Crocodilini 134. Caput reptilium Crocodilini. Mandibula 135. Caput reptilium Crocodilini. <i>Alligator</i> 136. Caput reptilium Crocodilini. <i>Alligator</i>
35	1886	<u>137</u> (4), <u>138</u> (3), <u>139</u> (5), <u>140</u> *(3)	137. Caput reptilium Crocodilini 138. Caput reptilium Crocodilini: Supramaxillaria frontaliter dissecta 139. Caput reptilium Crocodilini: olfactus 140. Caput reptilium Saurii Dolichocephali. <i>Psammosaurus griseus</i>
36	1886	<u>141</u> *(3), <u>142</u> *(4), <u>143</u> (4), <u>144</u> *(3)	141. Caput reptilium Saurii Dolichocephali 142. Caput reptilium Saurii <i>Lacerta viridis</i> 143. Caput reptilium Saurii <i>Psammosaurus griseus</i> , <i>Lacerta agilis</i> , <i>Lacerta viridis</i> 144. Caput reptilium Saurii <i>Iguana tuberculata</i>
37	1886	<u>145</u> *(3), <u>146</u> *(2), <u>147</u> (4), <u>148</u> (6)	145. Caput reptilium Saurii <i>Chamaeleo africanus</i> 146. Caput reptilium Saurii <i>Chamaeleo parsonii</i> et <i>C. africanus</i> 147. Caput reptilium Saurii <i>Anguis fragilis</i> 148. Caput reptilium Saurii: <i>Hatteria punctata</i>
38	1886	<u>149</u> (6), <u>150</u> (3), <u>151</u> (5), <u>152</u> *(4)	149. Caput reptilium Saurii <i>Hatteria punctata</i> et <i>Trachysaurus rugosus</i> 150. Caput reptilium Saurii <i>Chamaeleopsis</i> , <i>Phrynosoma</i> , <i>Platydictylus</i> 151. Caput reptilium Saurii <i>Pseudopus</i> et <i>Amphisbaena</i> 152. Caput reptilium Ophidii. <i>Tropidonotus</i> et <i>Python</i>
39	1886	<u>153</u> *(4), <u>154</u> (4), <u>155</u> *(3), <u>156</u> *(4)	153. Caput reptilium Ophidii. <i>Boa</i> , <i>Crotalus</i> , <i>Tropidonotus</i> et <i>Python</i> 154. Caput reptilium Ophidii. <i>Boa</i> , <i>Tropidonotus</i> , <i>Python</i> 155. Caput reptilium Ophidii. <i>Boa</i> , <i>Tropidonotus</i> , <i>Python</i>
40	1888	157(5), 158(4), 159(7), 160(6)	

pages, Lieferung wrappers, or from the title page of the entire work (occasionally resulting in the incorrect listing of 200 rather than 160 plates).

Many of Brühl's (1862) own earlier crocodilian illustrations were re-used in the *Zootomie* (e.g., selected figures on Pls. 6, 95, 96, 133, 134, 137), although his famous 1862 fold-out plate 20, showing the entire skeleton was not reproduced. However, the *Zootomie* included views not used in 1862, such as an exploded view of the skull in sagittal section (pl. 4, 1874; Figure 11) and de-

tailed views of the nasal passages (pls. 138, 139). In other instances similar views of different species were illustrated (1862 shows disarticulated views of *Crocodylus* only, whereas pls. 135 and 136 of the *Zootomie* show this for *Alligator*). Even when the same species was figured, it was often a different individual (compare *Gavialis* 1862: 8:3 [Figure 17] to 1874-86: 133, Fig. 5 [Figure 18]). Nonetheless, some figures are nearly identical, particularly those dealing with the limbs and vertebrae, but also many of those derived from outside sources.



**FIGURE 6.** Plate 23 from *Zootomie aller Thierklassen* showing the carpus of various salamanders (see Table 2). This is one of a series of plates featuring a black background and it includes a number of illustrations from other sources (see text).

Brühl's (1862) crocodilian anatomy atlas was relatively widely cited, appearing in many works although chiefly in those by German authors (e.g., Hoffmann 1876, Gadow 1882, Fürbringer 1900, Schumacher 1973). His *Zootomie* was also referenced often, especially in the decades following its publication and again, chiefly — but not exclusively — by authors writing in German (e.g.,

Born 1880, Baur 1886, Hoffmann 1890, Sewertzoff 1908, Versluys 1898, 1936, Camp 1923, Stadtmüller 1936, 1938a, b, Parsons 1970, Schumacher 1973, Ferguson 1985), although many of these citations provide incomplete or incorrect dates of publication. Friedrich Siebenrock, who had been Brühl's assistant at the Institute and who continued on the tradition of incredibly detailed

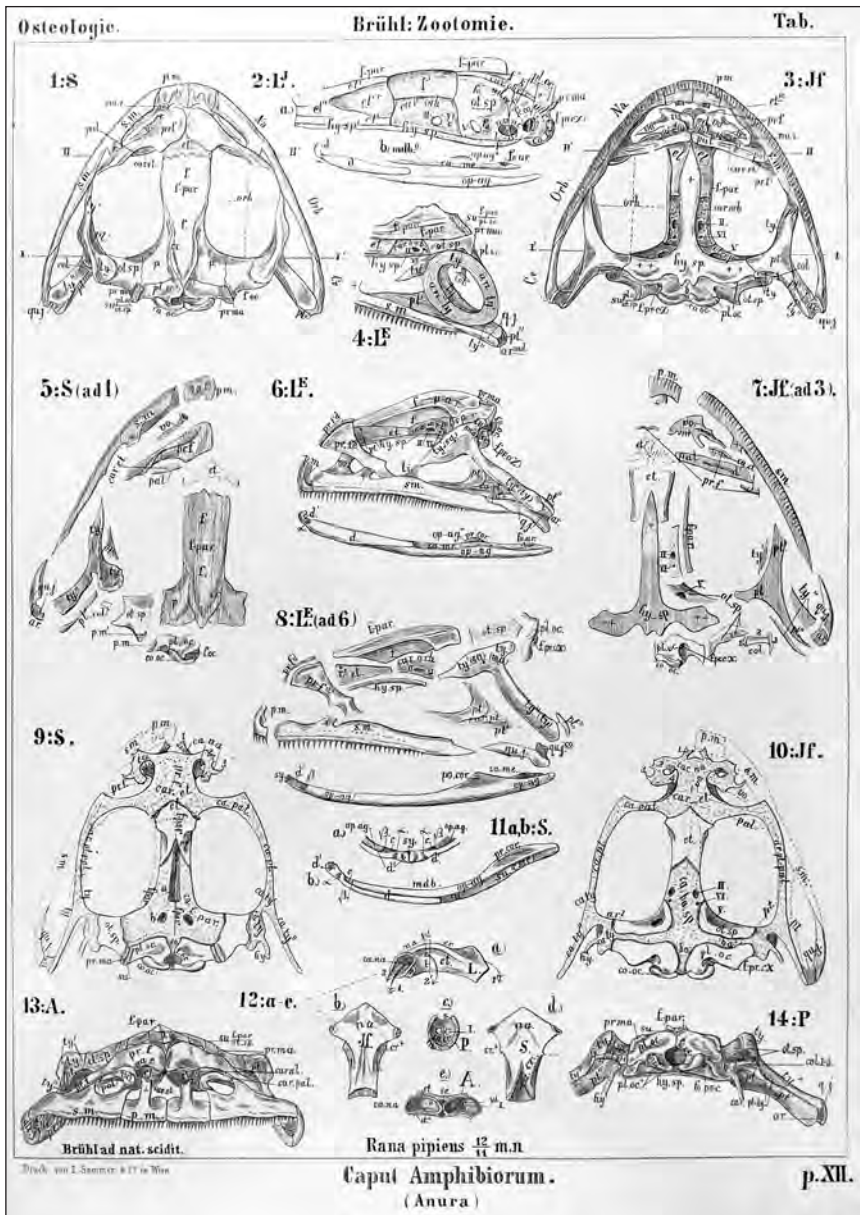


FIGURE 7. Plate 12 from *Zootomie aller Thierklassen* showing the skull of *Rana pipiens* [= *Lithobates pipiens*].

reptile anatomy, routinely cited his former supervisor (Siebenrock 1892, 1893a,b, 1894, 1895a,b, 1897, 1898), although he sometimes gave the dates of the work as 1874–1886 (Siebenrock 1892, 1895a), perhaps ignoring the last *Lieferung*, which dealt only with molluscs. Interestingly, however, many of the most comprehensive treatments of reptile anatomy, and especially osteol-

ogy, make no mention of any of Brühl’s published works (e.g., Bogoljubsky 1914, Williston 1925, Gadow 1933, Romer 1956, Jollie 1960) and, as a consequence, most anatomists and herpetologists today are unaware of Brühl’s detailed works.



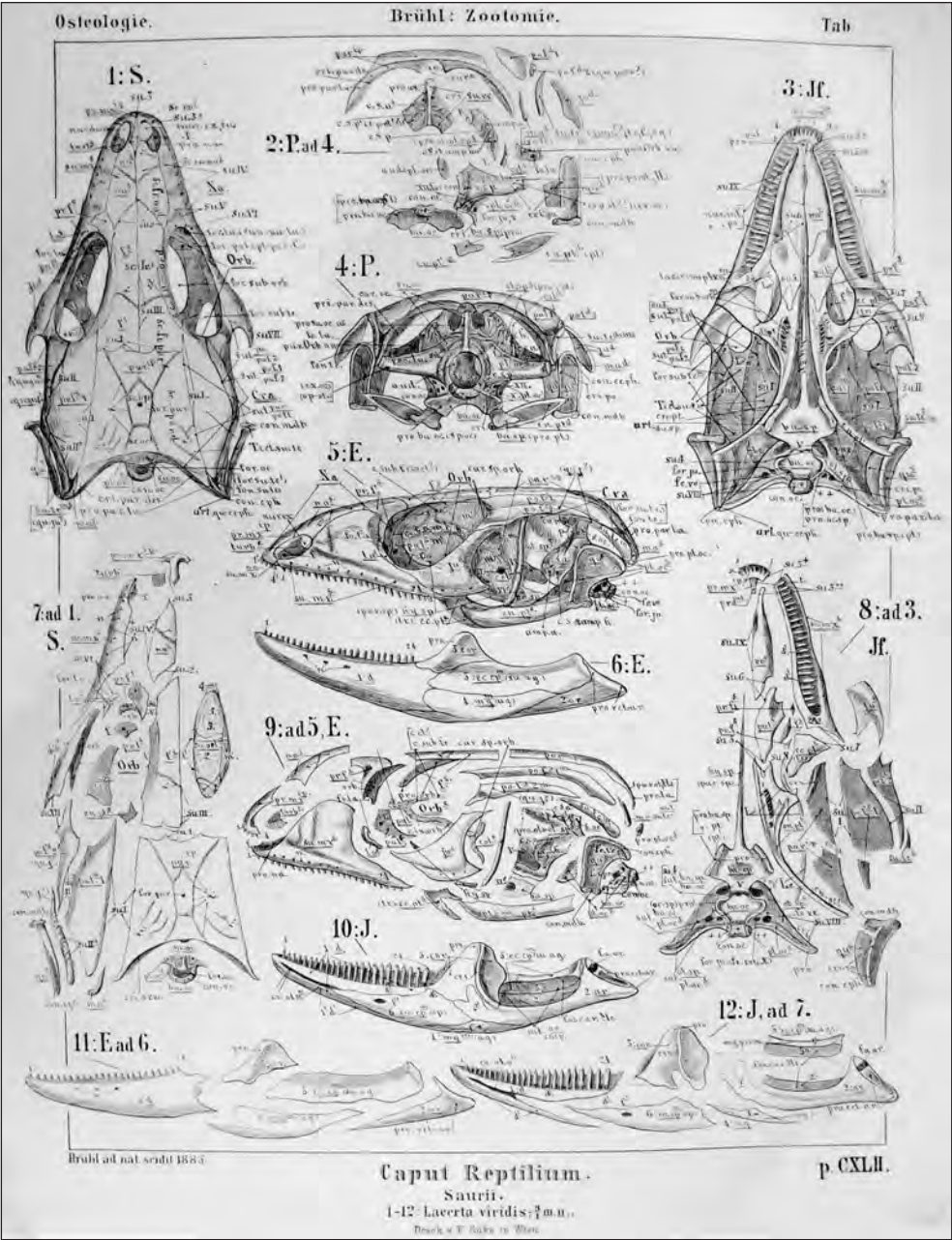
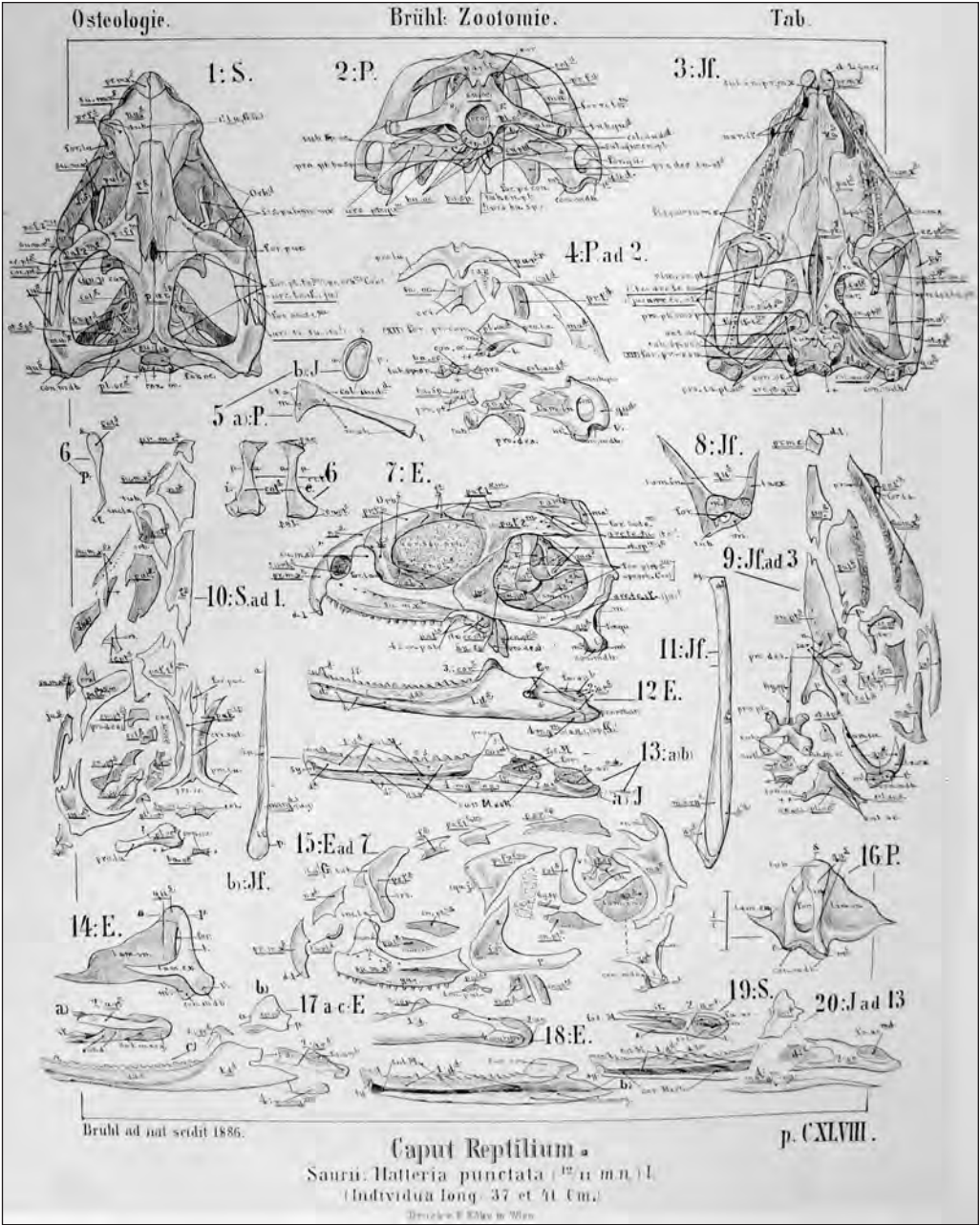


FIGURE 8. Plate 142 from *Zootomie aller Thierklassen* showing the skull of *Lacerta viridis*. Few if any anatomists, before or since, have matched Brühl's attention to detail.





**FIGURE 9.** Plate 148 from *Zootomie aller Thierklassen* depicting the skull of the tuatara, *Sphenodon punctatus*. Unfortunately, Brühl’s detailed osteology of this species has rarely been cited since the end of the nineteenth century.

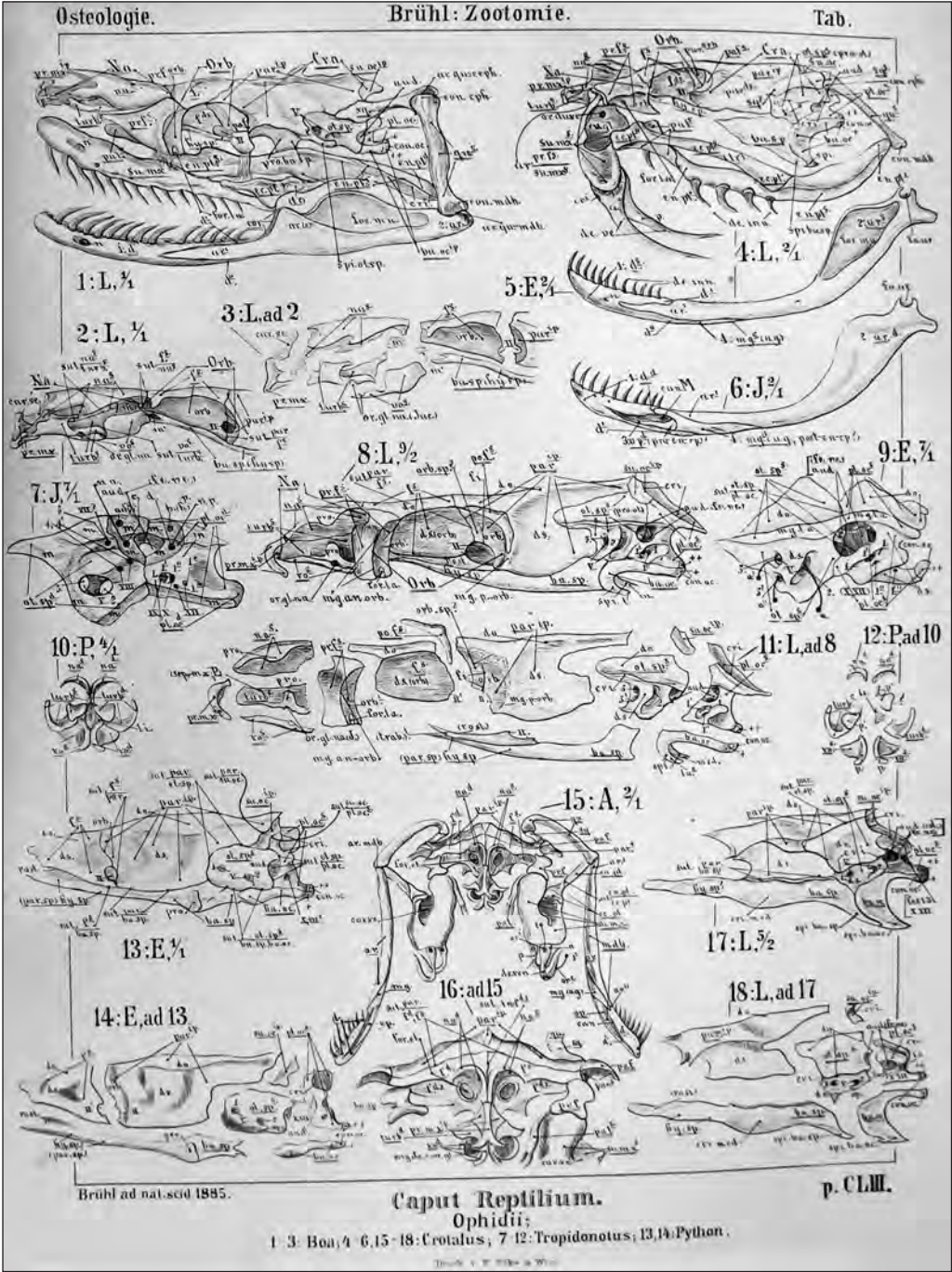


FIGURE 10. Plate 153 from *Zootomie aller Thierklassen* showing comparative osteology of the snake skull (see Table 2).



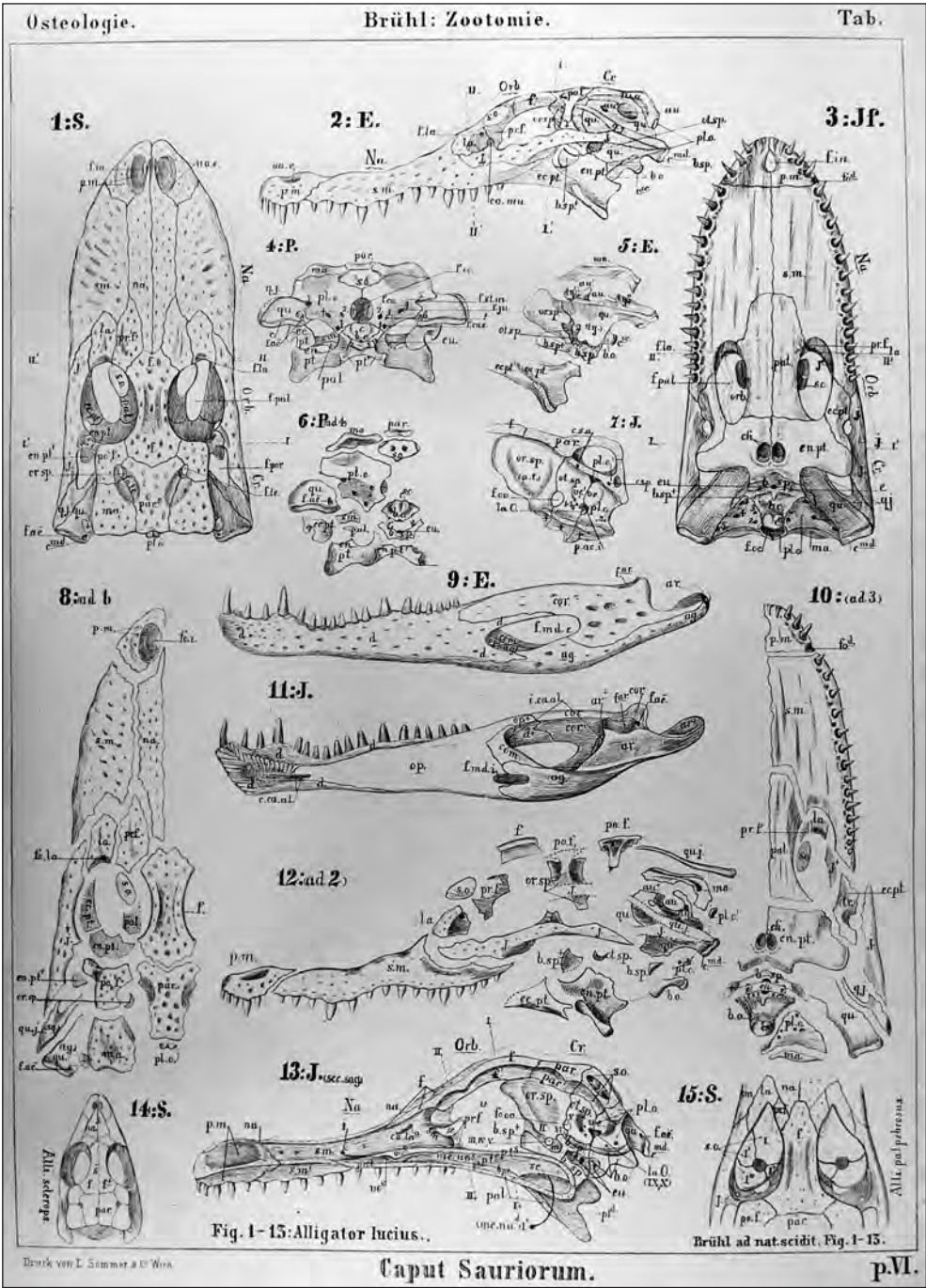
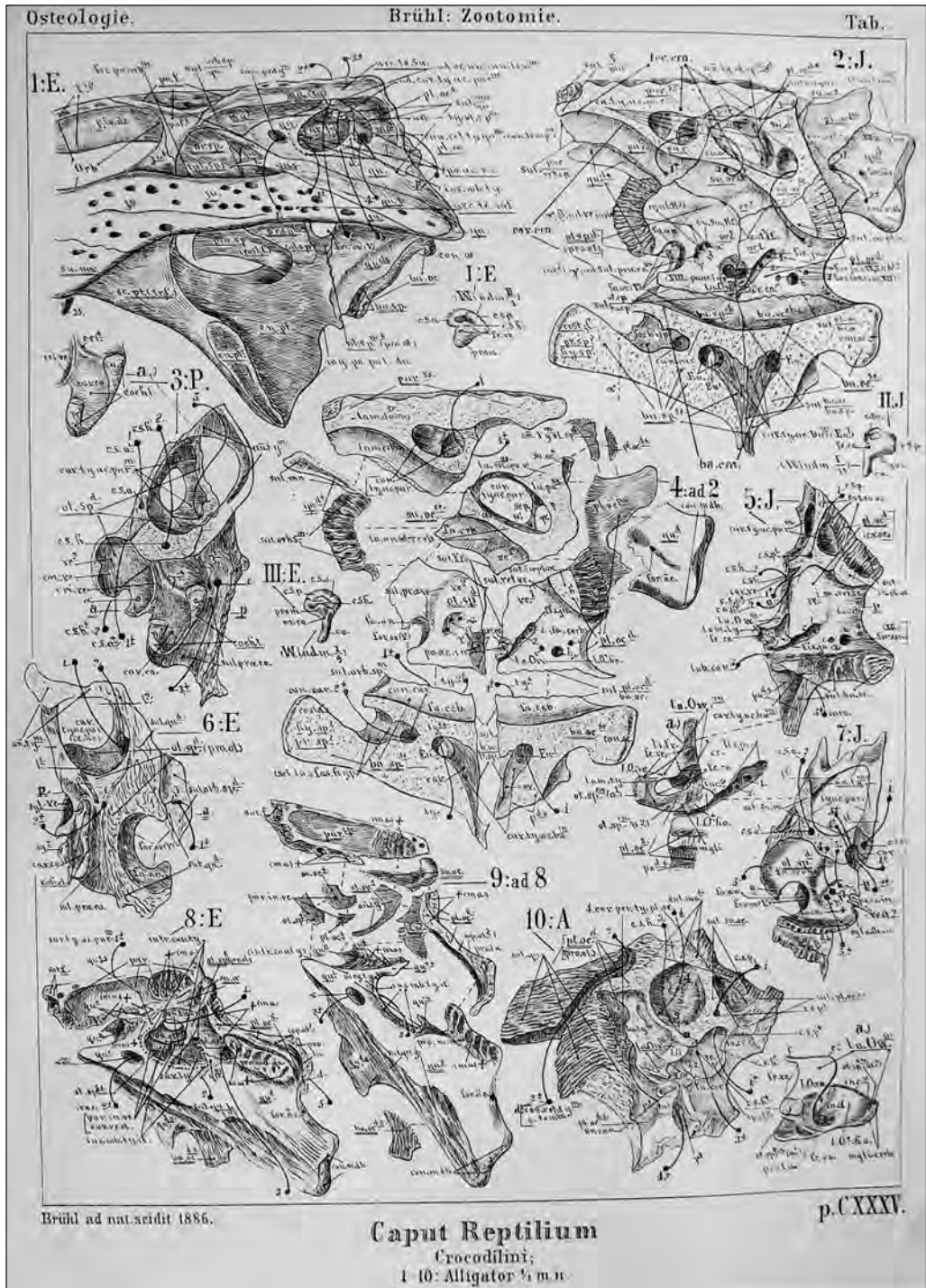


FIGURE 11. Plate 6 from *Zootomie aller Thierklassen* showing the skulls of three species of alligatorids (see Table 2) in a diversity of views. Despite having extensively illustrated crocodilians in his earlier (1862) monograph, Brühl provided many new figures of crocodilians, especially *Alligator*:



**FIGURE 12.** Plate 135 from *Zootomie aller Thierklassen* showing the individual elements of the skull of *Alligator mississippiensis*. This is one of the most detailed of all reptile plates in the work, with some figures bearing dozens of labels each.



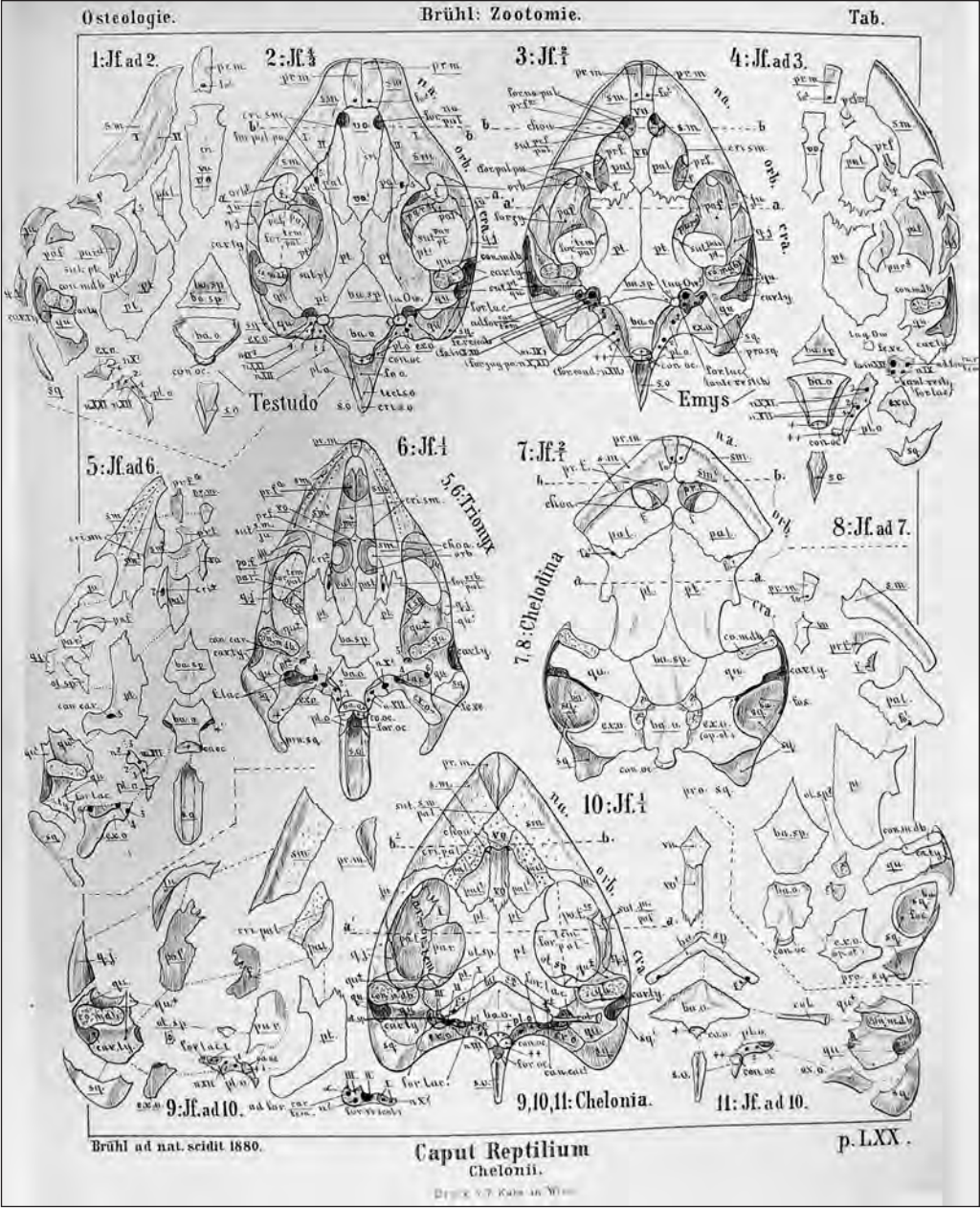
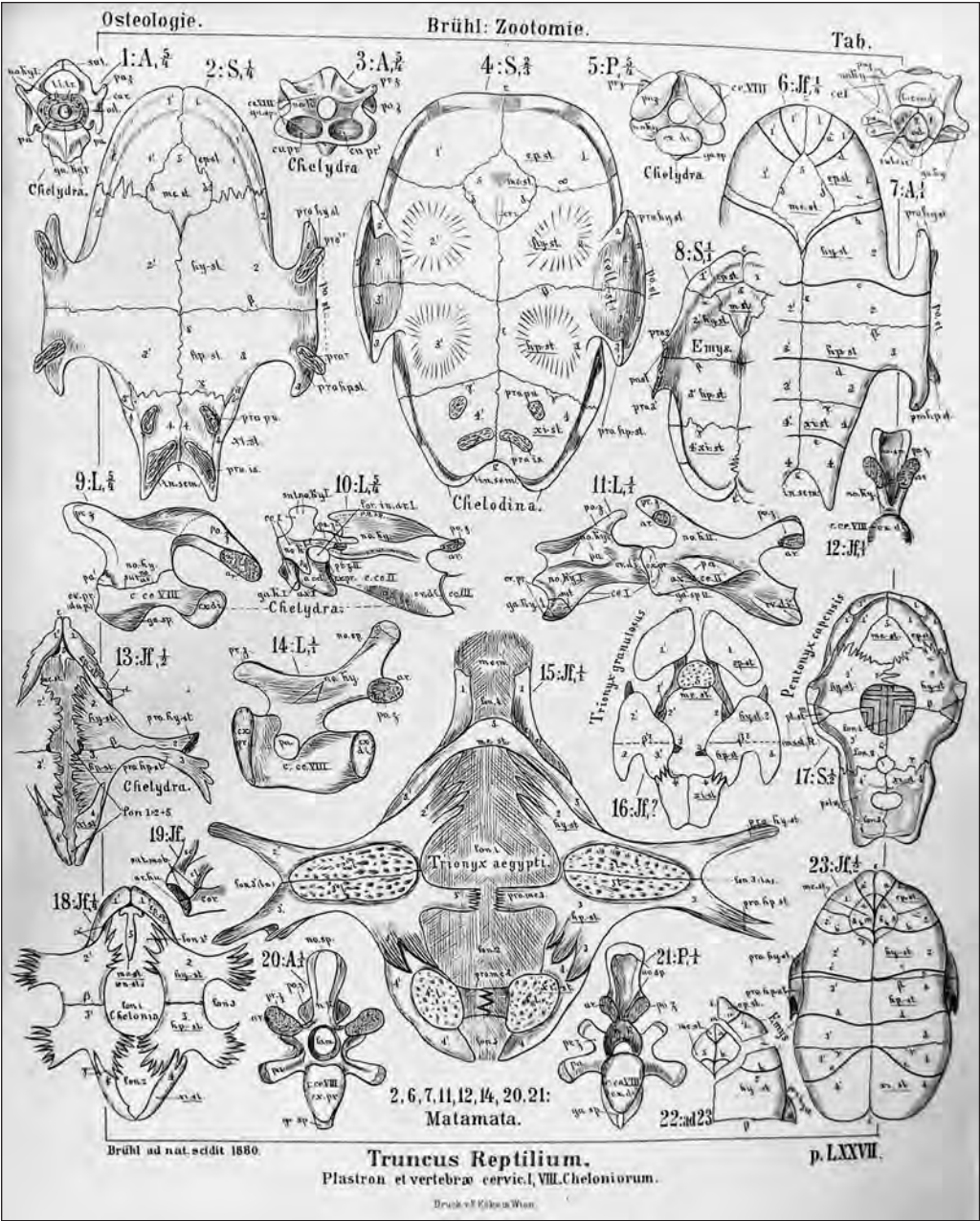
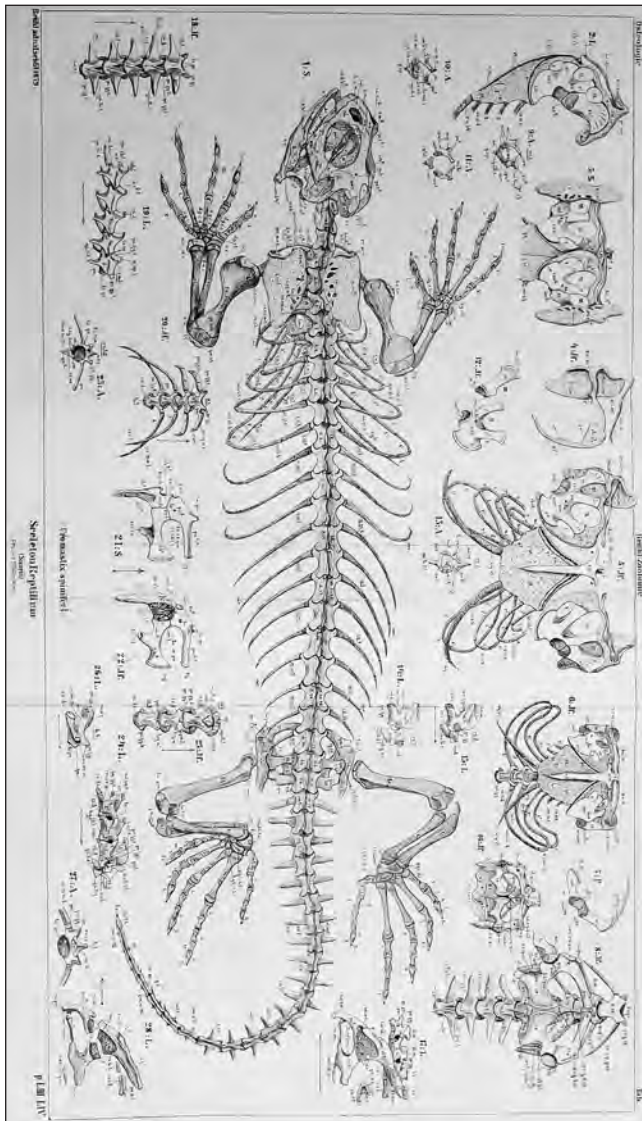


FIGURE 13. Plate 70 from *Zootomie aller Thierklassen* showing the skulls of a diversity of turtle species (see Table 2).



**FIGURE 14.** Plate 77 from *Zootomie aller Thierklassen* depicting the plastron and vertebrae of a number of turtle species (see Table 2). Although Brühl’s text is brief and mostly descriptive, he does discuss the homologies of the chelonian plastron and carapace.

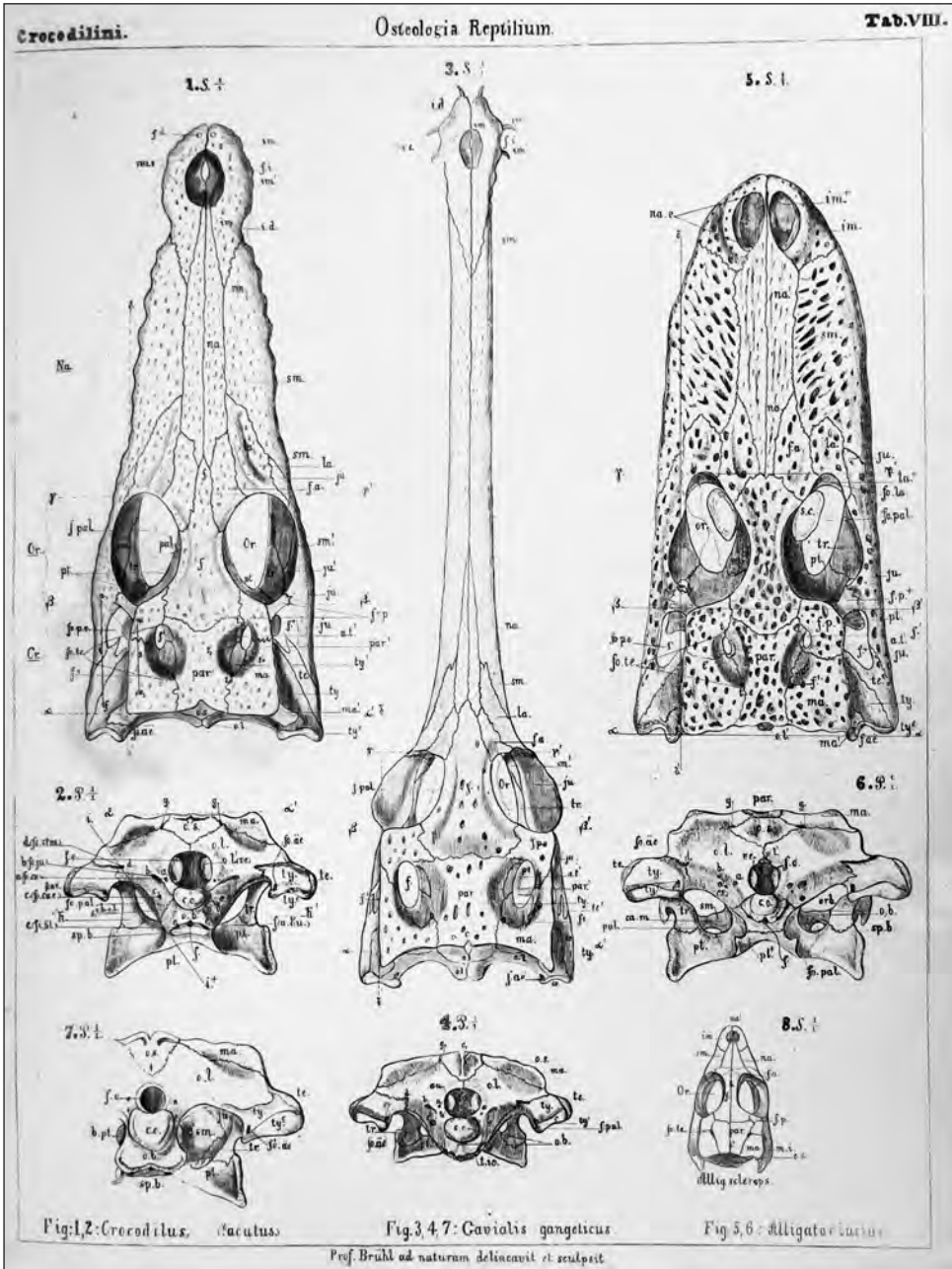




**FIGURE 15.** Plates 53 and 54 from *Zootomie aller Thierklassen* depicting the skeleton of *Uromastix spinipes* [= *Uromastix aegyptia*]. This was one of only two folding plates in the work and it was counted as two of the four plates in the Lieferung in which it appeared.



**FIGURE 16.** Page 552 from *Naturae Novitates* Nr. 18. This book catalogue of R. Friedländer & Sohn ran a listing of Brühl's available publications shortly after his death. Note that Brühl's given name is here spelled "Karl" rather than "Carl." Such substitutions were common and some other secondary sources, chiefly after his death, also use this spelling (see Anonymous 1899). However, we accept the spelling used preferentially by Brühl in life (see Figure 1) and given in his own publications.



**FIGURE 17.** Plate 8 from *Das Skelet der Krokodilinen* (Brühl 1862) showing the skulls of crocodilians. Compare with Figure 18. Note that Brühl used a different specimen of *Gavialis* (8:3) when compared to the later work.



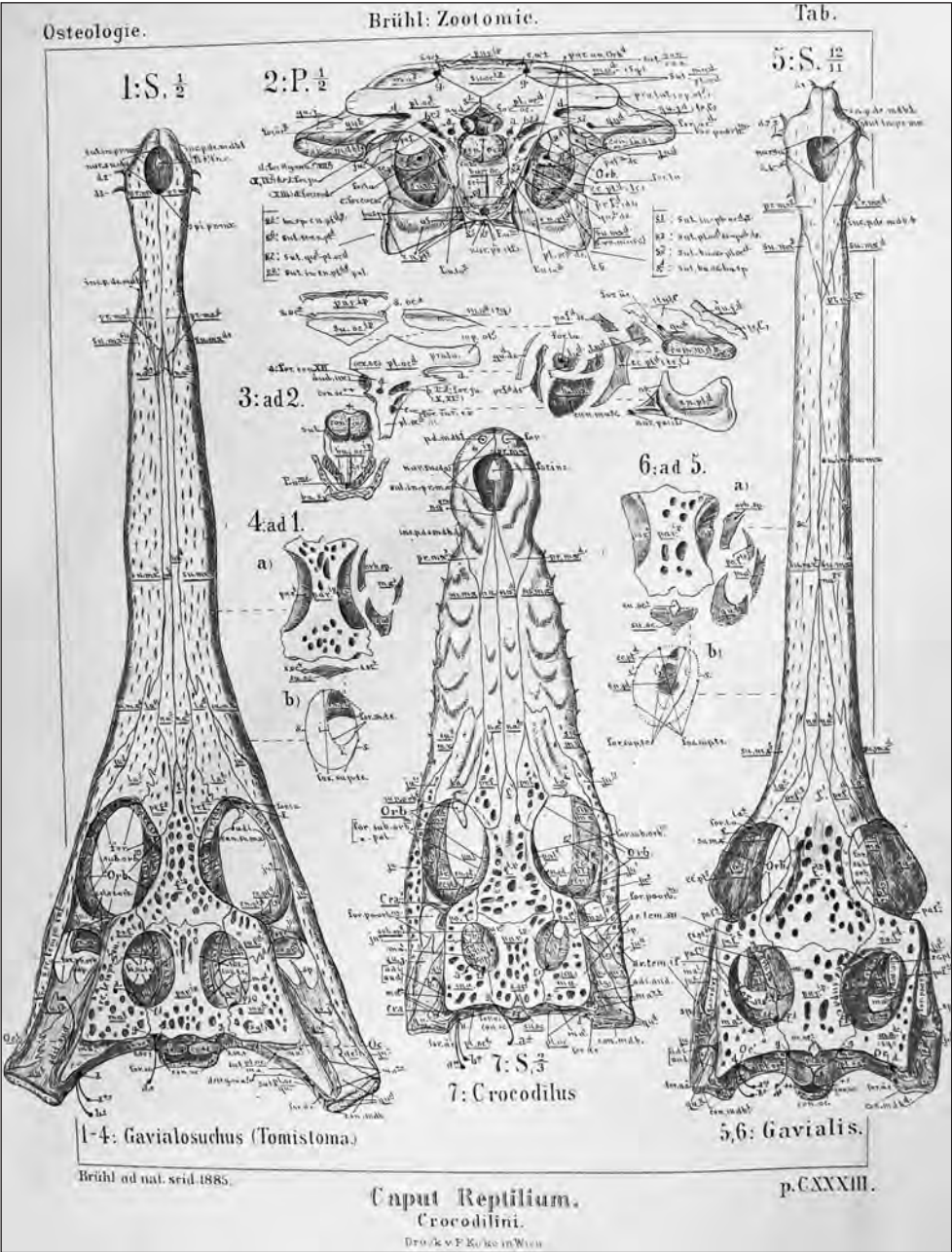


FIGURE 18. Plate 133 from *Zootomie aller Thierklassen* showing the skulls of crocodilians (see Table 2). Compare Figure 5 in this plate (*Gavialis*) with that in Figure 17. Although *Zootomie* recycled familiar themes from Brühl’s earlier works, many of the illustrations were redrawn, often based on different material.

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# CARL BERNHARD BRÜHL AND THE HERPETOLOGICAL CONTRIBUTIONS OF HIS ZOOTOMIE ALLER THIERKLASSEN

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# **“*Testudo torticollis*,” an unpublished name for the Matamata, *Chelus fimbriatus* (Schneider, 1783) (Testudines: Chelidae), with comments on early illustrations of the species**

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**Abstract.** The tropical South American Matamata, *Chelus fimbriatus* (Schneider, 1783), has been the subject of various studies by numerous naturalists across the last three centuries. Alexandre Rodrigues Ferreira, a Portuguese-Brazilian explorer of the late eighteenth century, was one of the first western scientists to have contact with the species, which he intended to describe as new under the name “*Testudo torticollis*.” This description, hand-written in 1784 during the Ferreira expedition to Brazil, was never published and remains unknown until today. We present a brief historical account regarding Ferreira’s studies on the Matamata, a complete transcription and translation of Ferreira’s description and reproductions of the original manuscripts and watercolors. A putative “type-specimen” of “*Testudo torticollis*” is also identified in the collections of the Museu da Ciência of the University of Coimbra, Portugal. We also present some notes on the drawing of the species made by the Portuguese priest Cristóvão de Lisboa in the seventeenth century, which appears to be the oldest available illustration of the species.

**Key words:** Brazil, Chelonia, Nomenclature, History of Science, Alexandre Rodrigues Ferreira.

## **INTRODUCTION**

The zoological results of the expedition of Alexandre Rodrigues Ferreira (1756–1815) to Brazil (1783–1792) have been published and studied by several authors (Carvalho 1965, Ferreira 1972, 2002, Vanzolini 1996, Raminelli 1998, 2001), although it is widely accepted that the results of the nine year “philosophical voyage” to Brazil assigned to Ferreira by the Portuguese government are still far from totally known. This is mainly due to the particular circumstances and events that affected him, his collections and documentation after the return of the expedition, and during the first half of the nineteenth century (Ceriaco *in press*). During the expedition Ferreira collected thousands of zoological, botanical, mineralogical and anthropological specimens, and produced a con-

siderable amount of documentation as well as drawings and watercolors (these latter produced by José Codina and José Joaquim Freire, the artists accompanying the expedition). All of these collections were deposited in the complex of the Royal Botanical Garden and Cabinet of Natural History of Ajuda (Real Jardim Botânico e Gabinete de História Natural da Ajuda), directed by the naturalist Domingos (formerly Domenico) Vandelli (1730–1816), Ferreira’s professor and Linnaeus’ correspondent, who turned the Cabinet into one of the richest natural history collections of the late eighteenth century (Ceriaco & Brigola *in press*). After his return from the expedition, and immediately after the death of Julio Mattiazzi (?–1794), the former gardener of the Botanical Garden and manager of the Royal Cabinet, Ferreira took Mattiazzi’s position. Besides Vandelli as director (whose political and

social positions limited his presence in the complex; see Ceríaco *in press*), Ferreira was the sole naturalist working at Ajuda, being responsible for all bureaucratic issues, internal management and curation, making any type of investigation or study almost impossible. Adding to this, the collections from his expedition were not well organized, were mislabeled and were subsequently partly transferred to Paris by Étienne Geoffroy Saint-Hilaire in 1808 (Bocage 1862; Daget & Saldanha 1989), which effectively prevented any attempts at study and publication by Ferreira. However, during the expedition itself, Ferreira managed to write several manuscripts intended for publication after his arrival in Portugal. Some of these papers have been recently published (Ferreira 1971, 1972, Anonymous 2002, 2003) and a list of the published zoological works of Ferreira is presented in Table 1.

During recent investigations on the history of Portuguese natural history collections from the eighteenth to nineteenth century (Ceríaco 2014, *in press*), several still unpublished Ferreira documents were located in the Arquivo Histórico do Museu Bocage (AHMB), the historical archive of the former “Museu Bocage,” now Museu Nacional de História Natural e da Ciência (MUHNAC), Lisbon. Two of these are Ferreira’s handwritten documents (AHMB ARF 18; ARF 18a) describing a new species of chelonian from Brazil — “*Testudo torticollis*.” A watercolor of the new species also exists in the AHMB, and was recently published (Anonymous 2002). Both the watercolor and the description were briefly noted by the malacologist Francisco de Arruda Furtado (1854–1887) in a biographical note on Alexandre Rodrigues Ferreira (Furtado 1886), and in the 1972 Brazilian commemorative edition that published several of Ferreira’s zoological and botanical works (Ferreira 1972).

The description and watercolor refer to a specimen of the Matamata, *Chelus fimbriatus* (Schneider, 1783). Ferreira’s description, written in 1784, constitutes one of the oldest references to the species besides the original formal description by Schneider, and that of Fermin (1765). Given its historic interest we here provide Ferreira’s origi-

nal description, both transcribing it and presenting a reproduction of the manuscript. We also present a brief historical note about the documents and Ferreira’s works. Finally, we have located the putative original specimen studied by Ferreira and drawn by the expedition artists.

## DOCUMENTS AND WATERCOLORS: PATHS OF DISPERSION AND CURRENT LOCATION

The manuscripts currently deposited in the AHMB are part of the original collection of Ferreira’s documentation deposited in the Royal Cabinet of Natural History of Ajuda. The documents were deposited in the Royal Cabinet in conjunction with shipments made during the expedition and immediately after Ferreira’s return to Portugal in 1792. These manuscripts remained in the Royal Cabinet collections until the close of the establishment in 1836, when all the collections, books and documents were transferred to the National Museum of Lisbon (Museu Nacional de Lisboa). The National Museum of Lisbon was established in the premises of the Royal Academy of Sciences of Lisbon (Real Academia das Ciências de Lisboa), in Bairro Alto, where it remained until 1858. In 1858 all the collections were then transferred to the Polytechnic School (Escola Politécnica) of Lisbon, and the museum was renamed the National Natural History Museum of Lisbon (Museu Nacional de História Natural de Lisboa). The museum comprised two sections, the zoological section (renamed the Museu Bocage in 1904), and the geological section. The new museum collections and scientific activity grew significantly during the second half of the nineteenth century, but stagnated during the twentieth century. In March 1978, a fire destroyed the entire zoological section and all of its collections, and damaged the geological section considerably. Yet, the documents of Alexandre Rodrigues Ferreira, as well as large parts of the historical archives of the Museu Bocage, survived the fire (Ceríaco 2014).

As noted above, the remaining manuscripts currently deposited in the AHMB are only a part of the original collection. During the time that the collections remained on the premises of the Royal



Academy of Sciences, a considerable part of the manuscripts and watercolors were loaned, following direct orders of the Portuguese Government, to the Brazilian ambassador Antônio de Menezes Vasconcellos Drummond (1794-1865) in 1842, in order to be properly studied and published. The compilation of those materials was delayed and the first resulting publications date from the second half of the twentieth century (Ferreira 1971, 1972). The majority of this collection is currently in the Biblioteca Nacional de São Paulo, Brazil, and the watercolors are digitized and fully accessible online<sup>1</sup>. A facsimile version of these materials was also published in the beginning of the 1970s (Ferreira 1971).

José Vicente Barbosa du Bocage (1827–1907), who was the director of the zoological section of the National Natural History Museum of Lisbon from 1858 until his death, managed to retrieve part of the original drawings and watercolors of Ferreira’s expedition. According to Furtado (1886), Bocage found two albums with Ferreira’s expedition drawings and watercolors in a grocery store near the Royal Palace of Ajuda and purchased these, returning them to the museum. The circumstances under which parts of Ferreira’s expedition watercolors were diverted from the Royal Cabinet are unknown, but there is the possibility that they were stolen during the civil war (1828–1834), potentially during the time when absolutist rebels, in September 1834, already after the end of the conflict, invaded and looted several mineralogical specimens and copper and iron instruments from the cabinet (Ceríaco *in press*).

These two sets of Alexandre Rodrigues Ferreira’s expedition drawings and watercolors include illustrations of several herpetological specimens. Specifically, regarding *C. fimbriatus*, there are four different representations: two drawings and one watercolor in the Brazilian collections, and one watercolor in the Portuguese collections. As already noted, the Brazilian set of material was published in 1971 (Ferreira 1971), and includes two black and white drawings representing the dorsal and the ventral views of an adult specimen,

depicted in a scientific display, most likely made from a dead and already preserved specimen, and a watercolor depicting an animal in lateral view, with much less detail than the former (Figure 1).

The single watercolor available in the Portuguese set depicts the dorsal view of an adult specimen (Figure 2, see also cover image). It is highly detailed and accompanied by a main caption naming it “TESTUDO Torticollis,” and a secondary caption with the following “Tartaruga do Salgado, tem de comprim<sup>o</sup> o casco 2 palmos, e 2 pollegadas: não se come, apenas os ovos.” [Saltmarsh Turtle, the shell length 2 palms and 2 inches: it is not edible, only the eggs.]. Both drawings and watercolors were made during the expedition or, at the latest, immediately after the return of Ferreira, in the drawing atelier of the Royal Cabinet of Ajuda.

There are few illustrations of pleurodiran turtles that predate the nineteenth century (Bauer & Schaffer 2006) and many of these are ambiguous. However, the distinctive morphology of the Matamata makes it easy to recognize among early images. Among the oldest published *C. fimbriatus* images are those appearing in Bruguère (1792), Schoepff (1795), Bechstein (1800), Daudin (1802) and Shaw (1802). Ferreira’s (at the time) unpublished images predate any of these, and yet they are not the oldest available representations of the species.

Completely unknown until the late 1960s, there is one image that we believe represents the oldest representations of a *C. fimbriatus* specimen. The image was made by Cristóvão Severim (1583–1652), also known by his religious name of Cristóvão de Lisboa. Cristóvão de Lisboa arrived in Maranhão, Brazil, as a Franciscan missionary in May 1624 and only returned to Portugal in 1635. In Brazil, besides his evangelical mission, he also dedicated himself to the inventory of the natural resources of the region and intended to publish a “Natural and Moral History” of Maranhão, which he never completed. However, he managed to write and illustrate a manuscript entitled “História dos Animaes e árvores do Maranhão Pelo muito Reverendo Padre Frei Christovão de Lisboa, Cali-

<sup>1</sup><http://bndigital.bn.br/dossies/alexandre-rodrigues-ferreira/> accessed on 14th June 2014

**Table 1** - List of Alexandre Rodrigues Ferreira's published zoological works. None of these works were published during Ferreira's lifetime; all represent published facsimile versions of manuscripts deposited in the Biblioteca Nacional do Brasil (BNB), Rio de Janeiro, Brazil, and in the Arquivo Histórico do Museu Bocage (AHMB), Lisbon, Portugal.

Original title	English translation of the title	Current location of the original manuscript	Reprint/facsimile edition
"Memória sobre o Peixe Pirarucu, de que já se remeteram dois da Vila de Santarém para o Real Gabinete de História Natural e agora se remetem mais cinco desta Vila de Barcelos, os quais vão incluídos nos cinco caixões que constituem parte da sexta remessa do Rio Negro"	Memoir about the Pirarucu fish, of which two specimens were already shipped from Vila de Santarém to the Royal Cabinet of Natural History, and of which now another five specimens from Vila de Barcelos follow included in the five boxes that constitutes the sixth shipment from Rio Negro	1) MUHNAC/AHMB ARF 19	
2) BNB Códice 21, 1, 1, 28	Ferreira (1972: 13–16)		
"Relação dos peixes dos Sertões do Pará"	List of fishes of the hinterlands of Pará	BNB Códice 21, 2, 2, 21	Ferreira (1972: 17–23)
"Memória sobre as Tartarugas"	Memoir about turtles	BNB Códice 21, 1, 19	Ferreira (1972: 25–31)
"Memória sobre as variedades de Tartarugas que há no Estado do Grão-Pará e do uso que lhe dão"	Memoir about the variety of turtles that exist in the state of Grão-Pará, and the uses that are given to them	BNB Códice 21, 2, 6, 3	Ferreira (1972: 33–35)
"Memória sobre a Jurarareté – As Tartarugas que foram preparadas e remetidas nos Caixões nº 1 até 7 da primeira remessa"	Memoir about the Jurarareté – the turtles that were prepared and shipped in boxes nº 1 to nº 7 of the first shipment.	BNB Códice 21, 1, 18	Ferreira (1972: 37–43)
"Memórias sobre os Jacarés do Estado do Grão-Pará"	Memoir about the alligators of the State of Grão-Pará	BNB Códice 21, 1, 29, 5	Ferreira (1972: 45–46)
"Relação dos animais quadrúpedes, silvestres, que habitam nas matas de todo o Continente do Estado do Grão-Pará, divididos em três partes: primeira dos que se apresentam nas mesas por melhores, segundo, dos que comem os índios em geral e alguns brancos quando andam em diligência pelo sertão; terceira, dos que não se comem"	List of quadrupeds that live in the woods around the State of Grão-Pará, divided into three parts: the first those of which are served at the tables of the better people, second, those eaten by Indians in general and by some white men when traveling in the hinterland; third those that are not eaten.	BNB Códice 21, 1, 35	Ferreira (1972: 47–57)
"Memória sobre o peixe-boi e do uso que lhe dão no Estado do Grão-Pará"	Memoir on the manatee and the uses it is given in the State of Grão-Pará	BNB Códice 21, 1, 13	Ferreira (1972: 59–65)

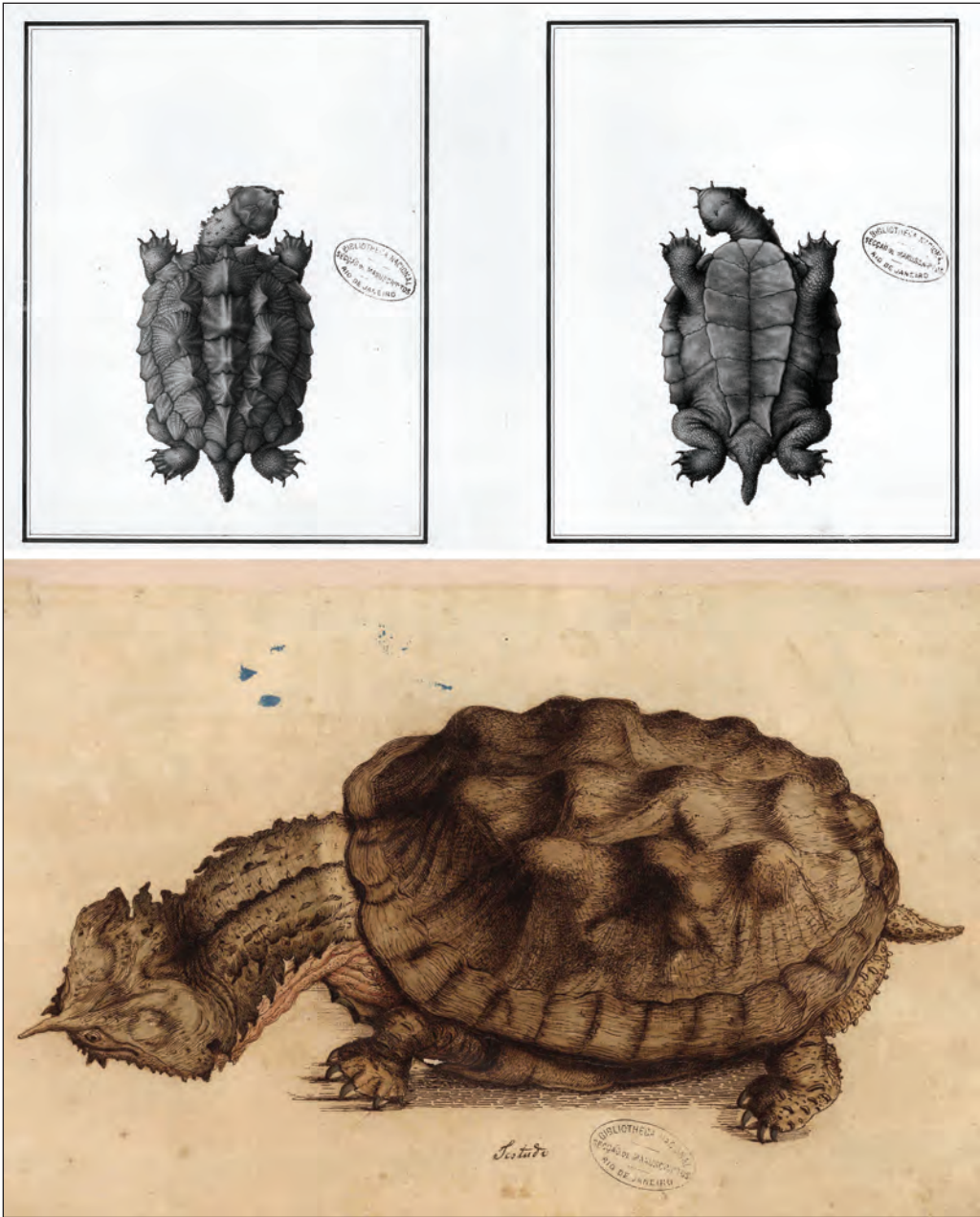
Table 1 - <i>Continued</i> ...			
Original title	English translation of the title	Current location of the original manuscript	Reprint/facsimile edition
"Observações gerais e particulares sobre a classe dos mamíferos no território dos Rios Amazonas, Negro e Madeira"	General and specific comments on the class of mammals in the territory of the Rivers Amazon, Negro and Madeira	BNB Códice 21,1,11	Ferreira (1972: 67–204); Anonymous (2003: 1–159).
"Índice dos desenhos zoológicos que constam do volume 1º da Viagem Filosófica do Pará"	Index of zoological drawings listed in volume 1 of Philosophical Journey to Pará	Unknown	Ferreira (1972: 205–214)
"Lista dos animais que fazem objeto das caçadas e das pescarias dos índios"	List of animals that are the object of hunting and fishing by the Indians	Unknown	Ferreira (1972: 215–222)
"Desenho de gentios, animais quadrúpedes, aves, anfíbios, peixes e insetos da Expedição Filosófica do Pará, Rio Negro, Mato Grosso e Cuyabá"	Drawings of natives, four-legged animals, birds, amphibians, fish and insects of the Philosophical Expedition to Pará, Rio Negro, Mato Grosso and Cuyabá [Watercolors]	AHMB ARF 32	Anonymous (2002: watercolors)
Iconografia – Zoologia	Drawings – Zoology [Watercolors and black and white drawings]	BNB Códice 21,1,1,4 and BNB Códice 21,1,3	Ferreira (1971)

ficador do Santo Officio, e Fundador do Maranhão da Recolecção de Santo António de Lisboa” [History of the animals and trees of Maranhão, by his high reverence the Priest Frei Christovão de Lisboa, censor of the Inquisition, and founder of the Santo António de Lisboa Mission of Maranhão], possibly between 1624 and 1627 (Lisboa 2000). The history of this manuscript and its associated drawings is completely unknown, until they were sold to the Portuguese government in 1934 by an antiquarian and deposited in the Arquivo Histórico Ultramarino in Lisbon. The manuscripts and drawings are together in a 30 x 22 cm binder made of thick parchment, with the phrase “Animaes do Maranhão” written on the spine, entirely in seventeenth century caligraphy. The binder contains a total of 198 pages, of which 164 are drawings of animals and plants. A facsimile edition was published in 1967 (Lisboa 1967), but a new and complete edition was then published in 2000, with some novelties and alterations relative to the 1967 version (Lisboa 2000). Among some other reptiles and chelonians, the single reference to the Matamata appears in folium 174v, “Matamata he armado não se come” [Matamata, is armored, is not edible]. There is also a drawing of the species, with the following inscription: “Motamota estampa” [Motamota plate], followed by a catfish (Figure 3). This drawing predates the first published image by Bruguière (1792) by 168 years.

**MATAMATA: A BRIEF TAXONOMIC AND NOMENCLATURAL HISTORY OF THE SPECIES**

The first published description of the Matamata was made by Barrère (1741) under the multinomial descriptor *Testudo terrestris major putamine echinato et striato*, sive *raparapa*, based on material from “Cayenne,” a name that was afterwards shortened to *Testudo terrestris* by Fermin (1765). The name was invalidated by the International Commission for Zoological Nomenclature, as it appeared in a work not adhering to the principles of binominal nomenclature (ICZN 1963). Some decades later in 1783, the German naturalist Johann Gottlob Theaenus Schneider (1750–1822) described the species as *Testudo fimbriata* in his monograph “Allgemeine





**FIGURE 1.** Drawing depicting the dorsal and ventral side of one specimen of Matamata, and watercolor of possibly the same specimen. Both pictures are from Alexandre Rodrigues Ferreira expedition and are currently deposited in the Biblioteca Nacional of São Paulo, Brazil, and accessible online (<http://bndigital.bn.br/dossies/alexandre-rodrigues-ferreira/> – accessed in 14th June 2014).

Naturgeschichte der Schildkröten nebst einen systematischen Verzeichnisse der einzelnen Arten und zwey Kupfern” (Schneider 1783). Although there are various nomina and combinations in the syn-

onymy of the Matamata (Fritz and Havaš 2007), only a single species is regarded as valid under the current name *Chelus fimbriatus*, used consistently since Rust et al. (1934). Despite some morphologi-



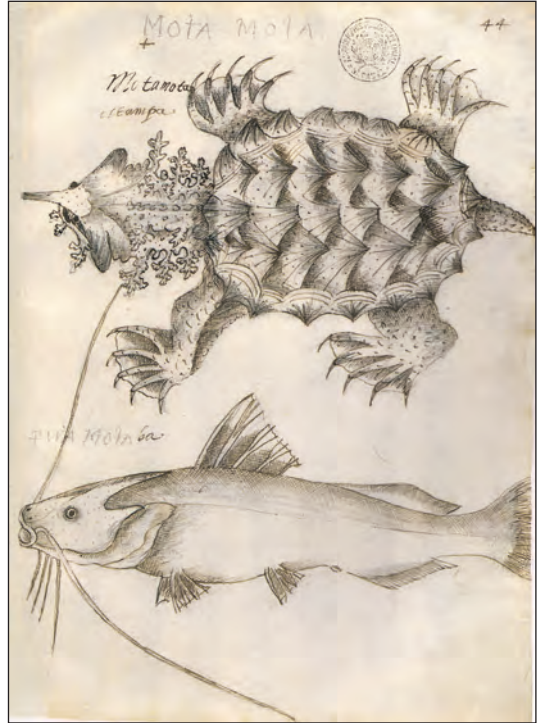
**FIGURE 2.** Watercolor from Alexandre Rodrigues Ferreira’s expedition to Brazil, currently deposited on MUHNAC (MUHNAC/AHMB/ARF/Watercolors, see cover image). This plate was to be used in the description, as it bears the *nomen* coined by Ferreira. The manuscript note says: “Tartaruga do Salgado, tem de compriment<sup>o</sup> o casco 2 palmos, e 2 pollegadas: não se come, apenas os ovos.” [Saltmarsh Turtle, the shell length 2 palms and 2 inches: it is not edible, only the eggs.].

cal evidence that the Matamata may comprise two different taxa, one from the Orinoco River system and the other from the Amazon (Schmidt 1966, Pritchard & Trebbau 1984, Sánchez-Villagra et al. 1995, Pritchard 2008), no formal taxonomic splits have been proposed, which appears supported by the most recent analyses (Garbin and Caramaschi 2015).

As Ferreira's manuscript with the original description has never been published or transcribed, his *nomen* was never used by any other authors. Given its scientific and historical interest, we below reproduce the original version in Latin, provide an English translation, and present comments. We note that under Article 11.6 of the *International Code of Zoological Nomenclature* (1999) "a name which when first published in an available work was treated as a junior synonym of a name then used as valid is not thereby made available." Thus, our use of "*Testudo torticollis*" in this paper, treated expressly as a synonym of *Chelus fimbriatus*, does not make Ferreira's name nomenclaturally available. The name *torticollis* would, however, be a fitting recognition of the pioneering works of Ferreira, should an unnamed species-level lineage ever be recognized for Matamatas of the Pará region of Brazil.

### **"ALEXANDRI RUDERICII FERREIRAE TESTUDO TORTICOLLIS (...)"**

The description of "*Testudo torticollis*" is divided in two different manuscript documents in the AHMB: ARF 18 and ARF . Both manuscripts were handwritten by Ferreira. Document AHMB ARF 18 is divided in two different pages. The first page represents a cover page, written in Latin and dated 23th January 1784 (Figure 4). The page starts with a Latinized version of Ferreira's name, followed by the name of the newly described species, its locality and collecting date. After a separation line, the local (Pará) name "Matamata" is given, followed by a brief abstract with the diagnostic characters of the species. The cover page finishes with the Latinized word for Lisbon: Olisipone. This suggests two different scenarios: if the date given refers to the



**FIGURE 3.** Drawing of the "Motamota" from Frei Cristóvão de Lisboa manuscript. Adapted from Lisboa (2000).

writing of the manuscript, Ferreira was at the time in Brazil, not in Portugal, which means that the paper would be published on his arrival; or, alternatively, the date may be that of collection of the specimen and the manuscript itself may have been written in Lisbon upon Ferreira's return.

Below is the transcription of the first page, followed by the translation to English.

"Alexandri Rudericii  
Ferreirae  
*Testudo torticollis*  
Quam  
In Lusitania Aequinoctiali  
collegit, atque descripsit  
Anno 1784" Januar 23.

---

*Paraenensibus Matamata.*  
Capite triangulari, depresso; testa margine serrata; triplici scutellorum ordine longitudinaliter dorsata; manibus, pedibus que 5-digitatis, palmato-unguiculatis  
Olisipone"



[Alexandre Rodrigues Ferreira, Testudo torticollis, which was collected in equinoxial Lusitania (= Brazil) on 23 January 1784, and is here described. In the Pará language it is called Matamata. Triangular head, depressed, edge of the Shell serrated; dorsal scutes ordered longitudinally in three rows; hands and feet with 5 fingers, webbed and clawed.]

ganized in four major sections: *Caput* (Head); *Truncus* (trunk); *Artus* (General view); and *Habitat*. The page appears to be a draft, as there are many annotations and corrections. The page also has an unsigned hand-written note by Bocage (authorship identified by its calligraphy) reading: “*Chelys imbricata* / Matamata.”

The second page (Figure 5) presents a more detailed description of the species, and it is or-

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“*Caput parvum, triangular, depressum; Ore amplo obtuso, ultra oculos dilatato; et potius Ranae quàm Testudini simili: Trianguli verticem producto in proboscidem brevem, cylindricum, ad finem naribus preparadami gracilem truncatum, naribus perforato. Appendices membranosus. Ramenta ad angulos laterales sana seabod, pendula fimbriati marginibus lavidis laces*  
[Left margin: *ad finem naribus perforatum*]

*Oculi ad angulum verticalem contigui; mandibulae superiori incumbentes, parvi ovatos rotundi, nigri, languidi.*

*Cirrho 2 in mandibula inferiore.*

*Gulae ramosa appendices 4.*

*Collum exertum, 9 Longum crassum tuberculis muricatum; sine inde xamantis [?] adspersum; recto proterum natisiti/ alioquin adhumeros deflexum.*

[Left margin: *Linees, tuberculate; 4-5 longitudinaliter exaratum; Linees, 3-tuberculatis longitudinaliter exaratum*]

*Truncus. Testa oblonga, pollices 16 Longa, 13-Lata, 5-alta margine serrato dentato, triplici scutellorum ordine Longitudinaliter serrata dorsata; scutelli + patelle formibus, radiatis; Striis circularibus concentricis [?] undulatis; radiis elevatis inaequalibus, fornicato - tuberculatis; vertica oblique carinato; tunica exteriore fragilis elytrata. Sternum posticum acutem bifidum.*

[Left margin: *Scutellis dorsalibus 13, inaequalibus, fornicatis, patelliformibus radicis; marginalibus 25 planis brevioribus*]

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*Artus. Brachua, Femora que brevia, crassa tuberculata; squamis rigidis imbricata.*

*Manus, Pedes que 5-digitati, palmato-unguiculati; unguibus longis; subarcuatis, rigidis acutis; supra nigris subtis flavescentiores.*

*Cauda conica, vix pedibus brevior; tuberculis, et squamis rigidis exasperata.*

---

*Habitat in Flumine Amazonico, et in coeteris confluentibus; plerumque in Fluviorum, et laculum fundo Lutulesto. Victitat muto [?] Pisciculos, Insectis, vermibus [millopeis]; Plantis fluvialibus, &. Caro alba, incalis plerisque esculenta; sed ingratis olens mollis, insipida, &.”*

[Small, triangular and depressed head; The mouth is large and obtuse, with wide eyes; more similar to a frog than to a tortoise; in the apex of the triangular head, a short, cylindrical and truncated pierced nose / The eyes are contiguous in a vertical angle, resting on the upper mandible, softly ovate, black and languid/ Two tendrils on the lower jaw / Four gular appendages / The stretched out neck measures 9 in long, and is thick and covered with tubercles, apart from the (?) / Trunk. Oblong Shell, 16 inches long, 13 wide, 5 in height, the toothed side of the margins 5 inches, dorsal scutes ordered longitudinally in three rows; 13 dorsal scutes, unequal, vaulted, in form of a plate at their roots, 25 shorter marginal scutes; stripes arranged in wavy concentric circles; unequal tubercular roots; keels

in a oblique position; external skin fragile, as frail as insect elytra. Plastron opening acute and bifid. / Artus. Arms and thighs are short, and have thick tubercles and imbricate rigid scales / Hands and feet, with 5 fingers, webbed and clawed; long claws, rigid and sharp; the dorsal part is black and the underpart is yellowish / The tail is conical, barely shorter than the feet; with tubercles and rigid scales/ Inhabits the Amazon River basin and its confluents, as well in the bottom of muddy lakes, Feeds on “mucus,” small fishes, insects, worms, millipedes; and fresh water plants. Its flesh is white and soft, but smells bad and is tasteless.

Finally, document AHMB ARF 18 (Figure 6.) presents only one manuscript page, and appears to be a corrected version of the latter.

It is divided into two main sections: Caput (Head) and Truncus (Trunk). In the end it is signed “Alexandri.”

“*Caput parvem, triangulare, depressum; ore bufonino, amplo, ultra oculos rotundato o quali, dilatato, Naso ad angulum verticalem producto na proboscidem brevem, cylindricum, gracilem, truncatam, naribus germinatam.*

*Appendices membranacei ad angulos laterales, bassi, verrucosi; penduli, marginibus suolaceres.*

*Oculi ad angulum verticalem contigui, maxillae superiori incumbentes, parvi, rotundi; nigri, Languidi. Cirrhi 2 in maxilla inferiore. Gulae appendices 4.*

*Collum exertum, pollices 9 longum, crassum deprefiusculum, lineae, tuberculate; 4-5 longitudinaliter exaratum, line vide apendicibus membranaceis 6 adpersum recto protensum/natantis aloequin ad numeros deflexum.*

*Truncus. Testa oblongo-ovata +, pollices 16 longa, 13 lata, 5 alta; supra planiuscula [?] , paturnale [?] brunea, subitis pallidior [?] scutetellori ordine Longitudinaliter dorsata; scutellis dorsalibus 13, inaequalibus, fornicatis, patelliformibus, radiati; marginalibus 25 planis, brevioribus, stris circularibus concentrico-undoulatus; radius elevatis inequalibus, verrucoso-tuberculatus; vertice oblique carinato; tunica externi fragili, elydrata. Hernum posticum acute bifidum.*

*Alexandri.*

A”

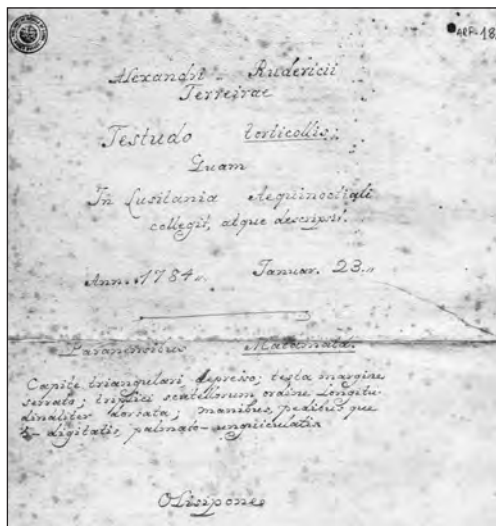
[Margin: + *marginet detato-serrato*]

[Small, triangular and depressed head; the mouth of a large toad; broad round eyes, nose terminates on the vertical tip of small, cylindrical, thin and truncate proboscis, The eyes are contiguous in a vertical angle, resting on the upper mandible, softly ovate, black and languid/ Two tendrils on the lower jaw / Four gular appendages / The stretched out neck measures 9 inches long, thick (?), with lines and tubercles, 4-5 longitudinal markings, 6 membranous adspersed appendices in a straight line stretching / floating. Trunk. Oblong Shell, 16 inches long, 13 wide, 5 in height, [?], dorsal scutes ordered longitudinally in three rows; 13 dorsal scutes, unequal, vaulted, in form of a plate in their roots, 25 shorter marginals, stripes arranged in wavy concentric circles; unequal tubercular roots; rays lifting unequally, warty and tuberculate, keels in a oblique position; external skin frail as insect elytrons. Plastron opening acute and bifid.

## IDENTIFICATION OF THE “TYPE” SPECIMEN OF “*TESTUDO* *TORTICOLLIS*”

In the collections of the former “Museu de Zoologia” of Coimbra University, currently part of the Museu da Ciência da Universidade

de Coimbra (MCUC), in Coimbra, Portugal, there is a single specimen of Matamata, currently under the catalogue name of *Chelus fimbriatus* (MCUC/ZOO.000.0088; Figure 7). The specimen has traditionally been identified as being from Alexandre Rodrigues Ferreira/ Ajuda collection, even if a complete historical



**FIGURE 4.** Cover page of the description of “*Testudo torticollis*,” the first page of the manuscript ARF 18 (MUHNAC/AHMB/ARF18).

study has never been done. Several specimens originating from Ajuda and from the Alexandre Rodrigues Ferreira collections still exist in the MCUC. A hand-written manuscript, currently deposited in the AHMB (AHMB ARF 26) and reproduced in Areia et al. (1991), reports a transfer of a large collection of zoological, botanical and ethnographic specimens to the University museum in 1806. Many of the specimens noted in this report, some of them from Alexandre Rodrigues Ferreira's expedition, still exist in the collections and have been identified (Anonymous 2000), although the document lacks any mention of Matamata, *Chelus fimbriatus*, *Testudo torticollis*, or any other synonym that could be identifiable with the specimen. Although this is the only transfer for which we have remaining documentation, at least two other transfers of specimens from Ajuda to Coimbra occurred in 1801 and in 1824 (Ceríaco *in press*).

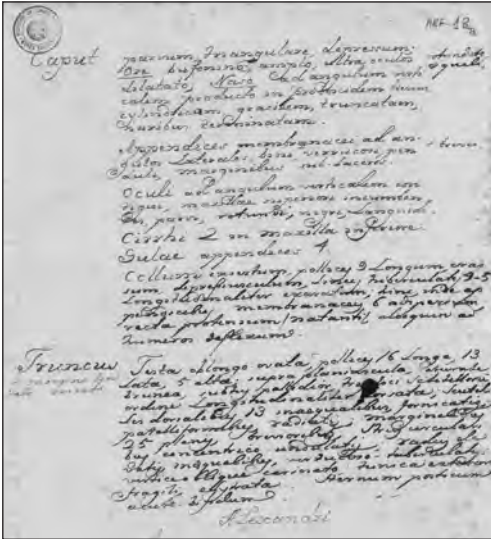
In the oldest manuscript catalog of the “Zoological collection of the University Museum,” dated from 1849, currently housed in the Library of the Zoology department of the University of Coimbra, there is already a refer-



**FIGURE 5.** Draft version of the description of “*Tes-  
tudo torticollis*,” the second page of the manuscript  
ARF 18 (MUHNAC/AHMB/ARF18).

ence to a specimen of “Matamata - *T. fimbria*. Gm.” Given that this is the only specimen of *C. fimbriatus* in the collection, and that it was already present in 1849, it is probable that the specimen came from the Ajuda collections. Reinforcing this idea is the fact that the fiber used to stuff the specimen is the same as that in other Ajuda chelonians, such as those studied by Ceríaco & Bour (2012). Unfortunately, the catalogue of the Brazilian herpetological collections of the Zoological Museum of the University of Coimbra, published in 1945 by António A. Themido, deals only with lizards (8 species) and snakes (20 species), giving no information about chelonians (Themido 1945). The specimen was also not mentioned in the commemorative catalogue published in 2000, even if many other Alexandre Rodrigues Ferreira specimens were positively identified and cited (Anonymous 2000). Nonetheless, the identification of the specimen as that of Ferreira is possible with great certainty. When comparing the watercolor to the specimen it is quite clear that the watercolor represents a mirror-image of the specimen. This situation is due to the technique used by the artists of the Royal Cabinet of Ajuda, as they initially





**FIGURE 6.** Simplified version of the description of “*Testudo torticollis*,” the single page manuscript ARF 18a (MUHNAC/AHMB/ARF18a).

would draw the animal on onionskin paper and only after that transfer it to regular paper, where the drawing would be painted (P. Salgado pers. comm.). Besides that, the watercolor is a highly detailed representation of the specimen from Coimbra, in terms of proportions, positions, scales and keels.

## FINAL REMARKS

Despite being intended for publication, Ferreira’s description has never been published. Strangely, Ferreira did not mention the name *torticollis* in any further manuscripts. In the 1794 manuscript catalogue of the collections of the Royal Cabinet of Ajuda, currently deposited on the Biblioteca Nacional do Brasil (BNB) in Rio de Janeiro (BNB 21,1,10: “Inventário geral e particular de todos os produtos naturais e artificiais, instrumentos, livros, utensílios e móveis pertencentes ao Real Gabinete de História Natural, Jardim Botânico e suas casas anexas como são gabinete da biblioteca, casa do desenho, dita do laboratório, dita das preparações e armazém de reserva, etc e tudo o que nele se declara.” [“General and particular inventory of all

natural and artificial products, instruments, books, tools and furniture belonging to the Royal Cabinet of Natural History, Botanical Garden and its houses, such as the library, drawing house, laboratory, house of preparations, storehouses, etc., and everything that exists”], the naturalist cited 8 “Matamata,” but not “*Testudo torticollis*.” It is possible that after his return to Portugal Ferreira had access to Schneider’s (1783) publication or the illustrated paper of Bruguière (1792) and, therefore, decided not to publish or use his proposed name for the species. The binomen *Testudo torticollis*, as far as we are aware, has never been published in any zoological work. Ferreira (1972: 210) included the binomen “*Testudo corticollis*,” and not the original Ferreira “*torticollis*,” in the list of the original drawings deposited in the Lisbon museum, however the caption that follows the original plate reprint in Anonymous (2002) is spelled “*torticollis*.” The first case represents a typographical error, or an erroneous transcription.

The present case provides a rare opportunity to understand how natural history research was done in the late eighteenth century. For his expedition, Ferreira carried a great variety of field gear, books and personnel. This is depicted in the famous watercolor portrait depicting the canoe that he used to travel in the Rio Negro and Amazon rivers, where Ferreira can be seen working at a cabinet with several books (Figure 8). The description of *T. torticollis*, done in the first year of his expedition, most certainly while he was in the Belém do Pará/Marajó region, and the highly detailed watercolor made by the expedition artists, was of top standard for the time with respect to its precision, detail and correctness. It is easy to understand that at the time he described it, he would not have been aware of Schneider’s book, as it is highly unlikely that copies would have been distributed as far as Portugal in the short time after a probable late spring or early summer publication (the preface of Schneider’s book is dated 23 April 1783), and Ferreira’s departure to Brazil was in August 1783.



**FIGURE 7.** Dorsal, ventral and lateral view of the putative “type specimen” of “*Testudo torticollis*,” in the collections of the Museu da Ciência da Universidade Coimbra (MCUC/ZOO.000.0088). Photos by Luis Ceriaco.

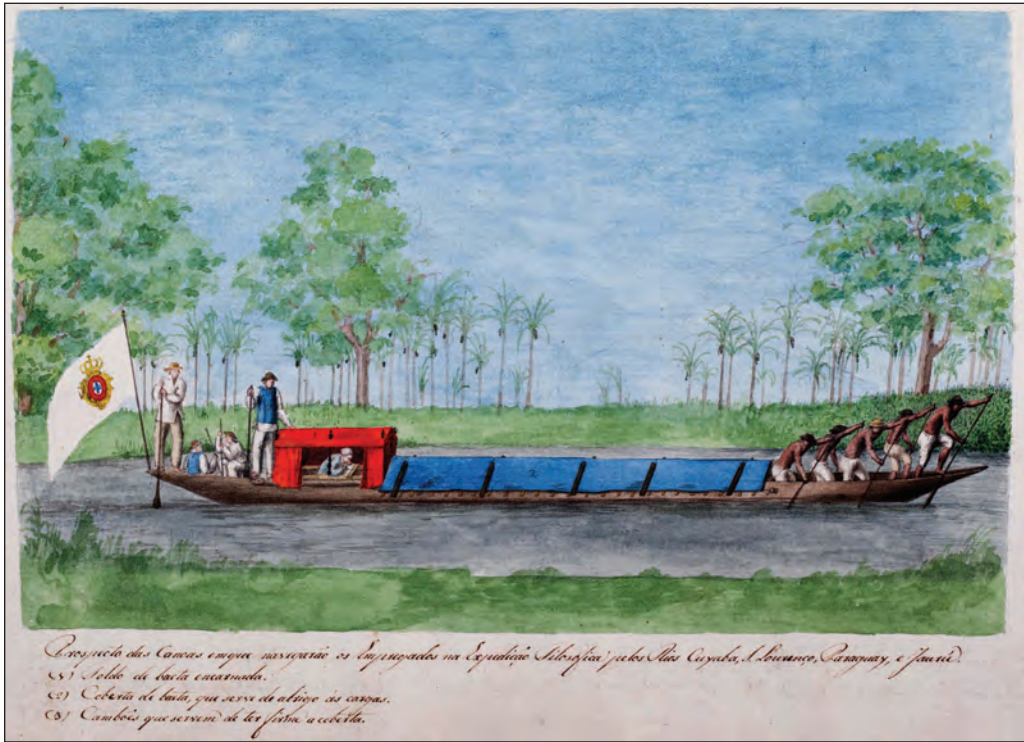
## ACKNOWLEDGMENTS

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provided important comments and suggestions which improved the original manuscript.

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**FIGURE 8.** Depiction of the canoe used by Ferreira and his colleagues to travel in the Amazon basin. Note Ferreira working under the red tent (on the left side of the canoe), with books on his left side. Collections were stored under the blue coverings occupying the center of the canoe. (MUHNAC/AHMB/ARF/Watercolors).

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# About the original description of Berlandier's tortoise, *Xerobates berlandieri* Agassiz, 1857 - Notes on Jean Louis Berlandier. II.

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... for the *Testudo* I would suggest the name of Berlandier,  
the poor unfortunate, unknown naturalist of Matamoras ...  
Spencer Baird to Louis Agassiz, 29 March 1856

**Abstract.** The tortoise currently known as Berlandier's or Texas tortoise, *Gopherus berlandieri*, was named *Xerobates berlandieri* in 1857 by Louis Agassiz. However, two names were previously proposed by Berlandier himself for the same species, and validly published: *Testudo tuberculata* Berlandier, 1850 and *Testudo bicolor* Berlandier, 1850. Then both names were almost or fully forgotten, respectively, and must be regarded as being *nomina oblita*. This note presents the still existing specimens examined by Agassiz, therefore belonging to the type series, as well as the tortoise *Testudo tuberculata*, named as such and illustrated by Berlandier in his manuscript notes. Lectotypes are designated for *Testudo tuberculata* and *Xerobates berlandieri*.

**Key words:** Berlandier, Turtles and Tortoises, *Gopherus berlandieri*, *Xerobates berlandieri*, *Testudo tuberculata*, *Testudo bicolor*, Smithsonian Institution, National Museum of Natural History.

## Descriptions originales de la tortue de Berlandier, *Xerobates berlandieri* Agassiz, 1857.

**Résumé.** La tortue terrestre principalement connue sous le nom de *Gopherus berlandieri* avait été décrite, en 1857, comme *Xerobates berlandieri* par Louis Agassiz. Cependant deux noms avaient auparavant été proposés par Berlandier lui-même pour cette espèce, et publiés de façon valide: *Testudo tuberculata* Berlandier 1850 et *Testudo bicolor* Berlandier 1850. Par la suite ces deux noms ont été respectivement presque ou totalement inusités, et doivent être considérés comme des *nomina oblita*, bien que disponibles. Cette note présente les spécimens examinés par Agassiz qui ont été conservés, considérés comme syntypes, ainsi que la tortue *Testudo tuberculata*, nommée ainsi et figurée par Berlandier dans ses manuscrits. Des lectotypes sont désignés pour *Testudo tabulata* et *Xerobates berlandieri*.

**Mots-clés:** Berlandier, Tortues, *Gopherus berlandieri*, *Xerobates berlandieri*, *Testudo tuberculata*, *Testudo bicolor*, Smithsonian Institution, National Museum of Natural History.

## INTRODUCTION

Biographical information, especially on the date and place of birth, of Jean Louis Berlandier (1803–1851) was provided together with some general background about his activities in Europe, then as a naturalist in Mexico, in the previous issue of this journal (Bour 2016). The present paper focuses more

directly on one of his core herpetological works, namely the discovery and description of a species of turtle that today bears his name: Berlandier's tortoise, *Gopherus berlandieri* (Agassiz, 1857). It contains among other details of historical importance transcripts of Berlandier's original manuscript notes as well as reproductions of his previously unpublished watercolor drawing of this species.

## PUBLISHED DESCRIPTIONS

The description of *Gopherus berlandieri*, originally as *Xerobates berlandieri* by Jean Louis Rodolphe Agassiz (1807–1873) was based on several individuals, at least partly originating from Jean Louis Berlandier's collections in Matamoros, Tamaulipas. They were brought from Mexico and Texas by Lieutenant, later Major General Darius Nash Couch (1822–1897), and kept in the US National Museum, Washington (Lawson 2012: 1–16). Couch honestly acknowledged their origin: “Undoubtedly there are many new species of vertebrata. I shall think twice before taking this and for Berlandière [sic] writing Couch, and though yet the collection will be mine, that gentleman now dead should have the credit for making it” (Couch's letter to Baird, Brownsville, 15 February 1853, in Dall 1915: 295). “All the specimens that I have seen were forwarded to me for examination by the Smithsonian Institution. They were collected by the late Mr. Berlandier, a zealous French naturalist, to whom we are indebted for much of what we know of the natural history of northern Mexico” (Agassiz 1857a: 447)<sup>1</sup>. More details about these tortoises appear in the correspondence exchanged between Agassiz and Spencer Fullerton Baird (1823–1887), which was edited by Herber (1963). To help Agassiz, who was preparing his monograph on American turtles, Baird sent him a great number of specimens, already registered in the Smithsonian collections under 52 distinct entries according to the exchanged letters (Herber 1963: 121–122, 127–128). Agassiz acknowledged “the receipt of the most instructive lot of turtles I ever saw.” For information, in Table 1 both complete lists of turtles are presented, modified from Herber (1963).

Unfortunately no collectors were mentioned, although there were also, besides the tortoises, turtles from Berlandier's collection: most probably Nos. 61, 62, 1529, and 1532. The online catalogue of the National Museum of Natural History, Division of Reptiles and Amphibians (<http://collections.nmnh.si.edu/search/herps/>) does not provide the name of the collectors. In the preface of his book on North American Turtles, Agassiz (1857b: xiv) only wrote “From Texas, and the adjoining

parts of Mexico, I have examined the rich collections made under the direction of Col. Emory during the boundary survey, and those secured by the Smithsonian Institution from the late Mr. Berlandier.” Obviously Baird had already noticed that the tortoises belonged to an undescribed species, but did let Agassiz to name it. The first mention by Baird is dated January 1856: “There are many new and curious things in it [a report]; *Testudo* from the Rio Grande, but very puzzling...” In the next month he questioned Agassiz: “What do you make of that *Testudo* from Texas and Mexico? Is it not an important addition to our fauna?” On 21 March the Harvard professor expressed his interest about these tortoises: “The *Testudo* from Texas and Mexico is the most interesting land turtle I have seen, very very closely allied to *T. Polyphemus*.” He later (23 March) asked Baird “Have you any wishes with reference to the naming of the new *Testudo* and the new *Kinosternon* and *Terrapene*?” Baird's answer (29 March) was of major importance for the future scientific name of the tortoise: “I have no choice whatever about the name of the new species although for the *Testudo* I would suggest the name of Berlandier, the poor unfortunate, unknown naturalist of Matamoras, who spent 26 years investigating the Natural History of Mexico and Texas and died obscurely just as he was nearly done<sup>3</sup>. He had collected specimens of this animal and given it a Mss name”<sup>4</sup>. And Agassiz agreed (1 April): “I shall follow your suggestion ...” (Herber 1963: 115, 123, 124, 129, 130).

In the original publication Agassiz provided a brief diagnosis: “It has a small yellow dot in the centre of the median and costal scales; the marginal scales are only edged with yellow. The sternum is narrower and more projecting in front than that of *X. carolinus* [*Xerobates carolinus*, synonym of *Gopherus polyphemus* (Daudin, 1801) according to Agassiz's nomenclature]; in the adult it is even forked. Behind it is broader and more turned downward. The centre of the scales remains granular for a longer time. The gland of the lower jaw is larger and more prominent. This species is smaller than the preceding, and limited to southern Texas and Mexico” (Agassiz 1857a: 447). A nice lithograph plate, artwork by Jacques Burkhardt and Antoine Sonrel, figures a hatchling: “The young is represented Pl.

**TABLE 1.** Specimens of turtles registered in the Smithsonian collections sent by Spencer Baird to Louis Agassiz, according to the exchanged listings (modified from Herber 1963: 121–122, 127–128). Agassiz added nomenclatural data and corrected Baird's numbering mistakes.

BAIRD		AGASSIZ	
<i>In alcohol</i>			
47	<i>Emys</i> . Fort Snelling Minn.	47	<i>Emys Bellii</i> ; Fort Snelling, Minn.
48	" Bet. San Antonio Fort Seger Texas.	48	} <i>Emys elegans</i> or allied spec. Between S. Antonio and Fort Sage
49	" " "	49	
50	<i>Sternotherus</i> " " "	50	} <i>Kinosternon</i> nov. spec. "
51	" " " Rio Bl—a.	51	
52	<i>Cistudo</i> " " "	52	} <i>Cistudo carolina</i> "
53	" " " "	53	
54	<i>Emys</i> . San Francisco, Cal.	54	<i>Emys nigra</i> Hallow. San Francisco Cal.
55	" Yellowstone	55	<i>Emys Bellii</i> Yellowstone Riv. Nebr.
56	" ( <i>elegans</i> ) Upper Missouri	56	<i>Emys elegans</i> Upper Missouri
57	<i>Cistudo</i> Upper Missouri	57	<i>Cistudo carolina</i> Upper Missouri
58	<i>Trionyx</i> (Head) Yellowstone	58	<i>Trionyx</i> (Head) Yellowstone
59	<i>Testudo</i> Lower Rio Grande, Tex.	59	} <i>Testudo</i> nov. spec. Lower Rio Grande, Texas
60	" " "	60	
61	<i>Sternotherus</i> " "	61	<i>Kinosternon</i> nov. spec. "
62	<i>Trionyx</i> " "	62	<i>Trionyx</i> nov. spec. "
63	<i>Sternotherus</i> Guadalupe Canon, Sonora	63	<i>Kinosternon sonoriense</i> LeConte Guadalupe Canon, Sonora
64	" Medina R. Tex.	64	} <i>Terrapene</i> nov. spec. Medina River, Tex.
65	" " "	65	
66	" Tucson, Sonora	66	} <i>Kinosternon sonoriense</i> LeConte Tucson, Sonora
67	" " "	67	
68	" Camp Yuma (Gila R.)	68	<i>Kinosternon sonoriense</i> yg of 63, 66, 67 Camp Yuma (Gila River)
69	" near San Antonio, Tex. (San Pedro)	69	} <i>Terrapene</i> nov. spec. the same as No. 64 and 65 Near San Antonio Tex.
70	" " "	70	
71	" " "	71	
72	" " "	72	
73	<i>Cistudo</i> Red River Ark.	73	<i>Cistudo carolina</i> Red River, Ark.
74	<i>Emys</i> . (varies) Monterey, Cal.	74	Ovaries of <i>Emys nigra</i> Monterey, Calif.
75	<i>Testudo</i> New Leon, Mexico	75	<i>Testudo</i> nov. spec. the same as No. 59 and 60, New Leon (Mexico)
76	<i>Emys</i> . " (near Cad [illegible])	76	<i>Emys concinna</i> ? New Leon
77	" Steilacoom, Puget Sound	77	} <i>Emys nigra</i> Hall. Steilacoom, Puget Sound
78	" Middle Fork of Amer. River, Cal.	78	
79	" Dogtown Creek of Arkansas R.	79	<i>Emys pseudogeographica</i> Dogtown Creek of Arkansas River
80	" Guadalupe Mts. Tex. Pecos R.	80	<i>Emys concinna</i> Guadalupe Mts. Tex.
81	" " "	81	<i>Emys Bellii</i> or new "
82	" Brownsville, Tex.	82	<i>Emys elegans</i> yg Brownsville, Texas.
83	<i>Sternotherus</i> Red River Ark.	83	<i>Kinosternon</i> nov. spec. yg of No. 50, 51, 61 Red River, Ark.
84	<i>Emys</i> . (Head) Brazos Texas	84	<i>Emys elegans</i> (Head) Brazos Tex.
85	<i>Testudo</i> Monterey, Mex.	85	<i>Testudo</i> nov. spec. the same as 59, 60, 75. Monterey, Mex.
86	<i>Sternotherus</i> San Antonio El Paso	86	<i>Kinosternon</i> nov. spec. the same as No. 50, 51, 61, 83 Between S. Antonio and El Paso
87	<i>Cistudo</i> Arkansas River	87	<i>Cistudo carolina</i> Arkansas River.
88	<i>Emys marmorata</i> , b B. & G. Puget Sound	88	<i>Emys marmorata</i> B & G = <i>E. nigra</i> Hallow. Puget Sound.
617	<i>Trionyx</i> Skeleton. Allegheny River, Pa.	617	<i>Trionyx</i> skeleton Allegheny River
106	" " Mississippi	1086	<i>Trionyx</i> skeleton Mississippi River
89	<i>Sternotherus</i> Shell " "	1089	<i>Kinosternon</i> " "
2035	<i>Emys</i> . " Lost River Cascade Mts. Oregon	2035	<i>Emys nigra</i> Lost Riv. Oregon
2155	" " W. of San Antonio Tex.	2155	} <i>Emys elegans</i> W. of San Antonio Texas
2166	" " " "	2156	
2157	<i>Trionyx</i> Skel. imp. R.Grande	2157	<i>Trionyx</i> nov. spec. same as No. 62 (Skelet. imperf.) Rio Grande.
1529	<i>Emys</i> . Matamoras	1529	} <i>Emys elegans</i> or allied Matamoras
1532	" " "	1532	
1528	<i>Testudo</i> " "	1536	<i>Testudo</i> nov. spec. same as No. 59, 60, 75, and 85. Matamoras

3, fig. 17–19" (*in* Agassiz 1857b). The whole work is considered as including the original description of the species *Xerobates berlandieri*.

However, it is evident that Berlandier previously identified this species, and was furthermore its first describer, even in a formal nomenclatural sense.



ABOUT THE ORIGINAL DESCRIPTION OF BERLANDIER'S TORTOISE,  
*XEROBATES BERLANDIERI*

In 1850, i.e., some months before his death (on 22 April 1851; see Bour 2016), he published with his friend the mineralogist Rafael Chovel [Chovell, Chowell] a *Diario de Viaje* [sic] (Berlandier and Chovel 1850). In the reptiles section, signed by Berlandier alone (Berlandier 1850: 287–291), the following descriptions are provided: “*Varias tortugas se hallan, tanto en las aguas del mar ó de los ríos, como en los llanos de Tamaulipas. Conocemos dos especies de tortugas terrestres, las dos notables por una prolongación del plastrón, formando dos puntas mas ó menos largas, según la especie. La tortuga tuberculosa* (Testudo tuberculatu [sic, for tuberculata]), se distingue de las demás por dos tubérculos en las partes laterales é inferiores del suelo [sic, for cuello]. La *tortuga bicolor* (Test. bicolor), es mas pequeña y de un color mas oscuro.” (Several turtles are found both in the waters of the sea or rivers, and the plains of Tamaulipas. We know two species of tortoises, both remarkable for a prolongation of the plastron, forming two points more or less long, according to the species. The *tuberculous tortoise* (Testudo tuberculatu) is distinguished from the others by two tubercles on the side and lower parts of the neck. The *bicolor tortoise* (Test. bicolor) is smaller and of a darker color).

These diagnostic characters are short but enough to make available the given binomina according to the *International Code of Zoological Nomenclature* (Anonymous 1999: Article 12.1). *Testudo tuberculatu* is a misprint, an *error typographicus*; there is “clear evidence of an inadvertent error” (from reference to the Berlandier’s manuscripts) which allows correcting the wrong spelling according to the Code (Anonymous 1999: Article 32.5.1), and *tuberculatu* was correctly emended as *tuberculata* by True (1882; see below). The type locality can be restricted to “los llanos de Tamaulipas.” Berlandier noticed for both the projecting gular scutes in front of the plastron. The first species, named *Testudo tuberculata*, was characterized by two neck tubercles, obviously the large mental glands under the lower jaw. The second one was smaller with a darker shell. Although an accurate observer, Berlandier segregated adults and juveniles of the same species. That is amazing given that during some

twenty years spent surrounded by these tortoises, Berlandier did not realize that there was only one species. Berlandier noticed that turtles lay eggs, but apparently he never questioned about the young of *T. tuberculata*.

From a nomenclatural point of view, *Testudo tuberculata* Berlandier, 1850 is preceded by *Testudo tuberculata* Schoepff, 1801, published only as a synonym of *T. coriacea* Vandelli, 1761. The name was attributed by Schoepff (1801: 123) to Pennant, who named it *tuberculatus* in English (Pennant 1771: 271), but sent to Schoepff a nice drawing bearing the name *T. tuberculata* (archives Hermann von Helmholtz-Zentrum für Kulturtechnik, Humboldt-Universität zu Berlin: <http://www.sammlungen.hu-berlin.de/dokumente/15008/>). *Testudo bicolor* has apparently no senior homonym, although a CITES list (<http://www.cites.org/eng/cop/11/prop/36.pdf>) mentioned *Testudo bicolor* Schweigger, 1812 as a synonym of *Testudo amboinensis* Daudin, 1801, certainly a mistake for *Terrapene bicolor* Bell, 1826. Therefore, both of Berlandier’s names are available, but apparently only one was used again in the literature after the original description, by Frederick True (1882: 441) in his fine work on the genus *Xerobates*, as *Testudo tuberculata*, attributed to Berlandier<sup>5</sup>.

The short text published by Berlandier in 1850 was probably copied and summarized from a manuscript in French, *Voyage au Mexique par Jean Louis Berlandier pendant les années 1826 à 1834*, which was much later translated into English<sup>6</sup>, published and annotated under the title *Journey to Mexico during the years 1826 to 1834* (Berlandier 1980). These observations were registered near the end of October 1830 in San Fernando de las Presas, according to the joined date and locality: “Two species of terrestrial turtles were found in those low-lying regions, and they are common on both banks of the Rio Bravo. One of them (*Testudo tuberculata* B. mss.) is remarkable for two rounded tubercles under the neck. It often serves as food for the military of the presidios when they travel in the wilderness. The other species of these turtles, which I have designated as *Testudo bicolor*, is very small and, like the preceding, has at the anterior part of the plastron two teeth, or pro-

longations. These are so long in the tuberclose turtle that they serve to support its neck and head.” (Berlandier 1980: 468). A footnote was added by the editor: “*Gopherus berlandieri* (Agassiz) and *Terrapene ornata* (Agassiz) are the only species of turtle on the Rio Grande. Berlandier’s names in the following sentence were apparently never published.” Actually Berlandier clearly distinguished *Gopherus* and *Terrapene*, because earlier he did encounter and identify as such the latter genus [ca. 22 April 1828, near B  xar]: “Forced to camp on the spot we searched for a stream, which someone named the Arroyo de Sanchez. On the prairie we found a terrestrial turtle of the kind whose plastron is divided transversally by a hinge into two parts: one part could be called pectoral and the other abdominal.” (Berlandier 1980: 313). Rose and Judd (2014: 8) apparently read only Berlandier’s 1980 translation, but neither the original 1850 book nor his manuscripts at the Smithsonian Institution. However, from the published translation of *Voyage au Mexique*, they concluded “Clearly, Berlandier knew the difference between *Gopherus berlandieri* and *Terrapene ornata* ...”

The individuality of the genus *Xerobates* vs. *Testudo*, taxonomically created and nomenclaturally coined by Agassiz (1857: 446), was justified, but Stejneger (1893: 161) resurrected later the senior subjective synonym *Gopherus* Rafinesque, 1832, although it was at that time a *nomen oblitum*. The type species of *Xerobates* Agassiz, 1857 by subsequent designation of Brown (1908: 115) is *Xerobates berlandieri* Agassiz, 1857 (cf. Bour and Dubois 1984), not *Xerobates agassizii* Cooper, 1861 as erroneously stated by Crumly (1994: 8), recently repeated by Rose and Judd (2014: 14), and Bramble and Hutchison (2014: 2). *Xerobates* is currently considered as being a subjective synonym of *Gopherus*, of which the type species is *Testudo polyphemus* Daudin, 1801 by original designation (Rafinesque 1832: 64). However, Bramble and Hutchison (2014: 2, 5) and Franz (2014: 16) argued, with substantial data, for the splitting of the present species of *Gopherus* into two genera, *Gopherus* and *Xerobates*, included in the subfamily of Xerotatinae. The present paper was written before this publication, but being convinced by this taxonomy and in favor of the “Evo-

lutionary Perspective” of these authors, here I follow their nonconformist position, contrary to the other co-authors of *Biology and Conservation of North American Turtles* edited by Rostal, McCoy and Mushinsky (2014) and the most recent checklist available (van Dijk et al. 2014).

The “standard” trivial name for *Gopherus berlandieri* was for a while Texas Tortoise according to the *Official Names List* proposed by a federation of American and Canadian herpetological societies (Iverson et al. 2012), and therefore is commonly used. Murphy (2014: 26) rightly outlined that “*Gopherus berlandieri* ... has a larger distribution in Mexico and, thus, the common name ‘Texas tortoise’ does not seem appropriate.” Amazingly, Rose and Judd (2014) reversed their 1982 position and used Texas tortoise, even as the title, for their recent book about that species. Nevertheless, Berlandier’s tortoise was and is still current in major publications (True 1882: 446; Dietmars 1907: 126; Pope 1939: 245; Carr 1952: 328; Schmidt 1953: 105; Morafka 1977: 83; Behler and King 1979: 472; Rose and Judd 1982: 57; Iverson 1992: 259; Charette 1999: A-2; Vetter 2004: 9; Pritchard 2006: 275; Ernst and Lovitch 2009: 570; Vitt & Caldwell 2013: 538), and it will be reinstalled as standard name (Iverson et al., in press.; pers. comm. John Iverson). According to King and Burke (1989: 83) and Charette (1999: B-30), Tortuga de Tamaulipas is encountered as Mexican name, although, following Liner (1994), online information systems such as the *Integrated Taxonomic Information System* ([www.itis.org](http://www.itis.org)) and the *Global Biodiversity Information Facility* ([www.gbif.org](http://www.gbif.org)) use Gal  pago Tamaulipeco. In French Tortue fousseuse de Berlandier was proposed (David 1994: 53; Bonin et al. 2006: 275), but the adaptation in French (Canadian) of the *Official Names List* inopportunely introduced Tortue du d  sert du Texas (Green 2012: 55).

## MANUSCRIPT DESCRIPTIONS

In his paper mentioned above, True (1882) did not base his comments about *Testudo tuberculata* on the published diary (Berlandier and Chovel 1850), but on the original manuscript notes: “The use of Berlandier’s name in the denomi-

ABOUT THE ORIGINAL DESCRIPTION OF BERLANDIER'S TORTOISE,  
*XEROBATES BERLANDIERI*

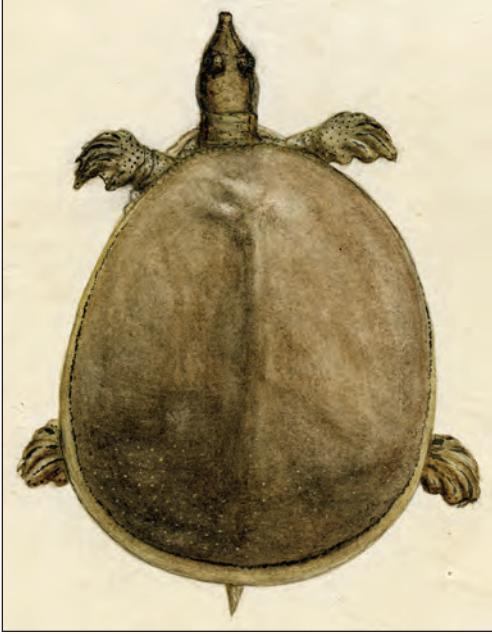
nation of this species [*Xerobates berlandieri*] is very appropriate, since that unfortunate naturalist was not only the first to collect specimens of the tortoise, but was the first to describe it. His manuscripts, deposited in the Smithsonian Institution, contain an extended description of the animal, under the name *Testudo tuberculata* together with a carefully-drawn figure, and some notes on its distribution.”

Copies of both manuscript descriptions and illustrations of turtles from Berlandier's papers were provided by Tad Bennicoff, Assistant Archivist, Smithsonian Institution Archives. These papers are registered in Record Unit 7052, Box 9, Folder 1 and Box 12, Folder 15. Accounts (in French) by Berlandier are duplicated: they include a first draft already well written (fully covering the page) and a second one (only covering the right half), which can be considered as a version ready to be published. The clear and clean writing by Berlandier is easily comprehensible. Five species are described by the naturalist. *Emyda viridis*, a sea turtle, first named *Testudo mydas*, is the Green Turtle *Chelonia mydas* (Linnaeus, 1758). *Trionyx ferox*, a softshell turtle, is currently named *Apalone spiniferus emoryi* (Agassiz, 1857). *Emys bicolor*, a freshwater turtle, is presently identified as *Trachemys scripta elegans* (Wied, 1839). Finally *Testudo minima*, first named *Testudo bicolor*, and *Testudo tuberculata*, are tortoises, both of which both belong to the species currently known as *Xerobates* or *Gopherus berlandieri*. Only three species are pictured, in watercolors: *Trionyx ferox* on pl. VI (present Figure 1, and in color on the cover of volume 12(1&2) of *Bibliotheca Herpetologica*), *Emys bicolor* on pl. IV (present Figure 2), and *Testudo tuberculata* on pl. V (present Figure 3). The author was almost surely Berlandier himself; there is no signature, but only an artist well abreast with natural sciences could make so accurate depictions. Actually Berlandier probably illustrated all the objects of natural history, and his authorship was never challenged. The second main artist whose paintings are included within Berlandier's manuscripts is Lino Sánchez y Tapía, who worked with him from 1828 to 1838 (Sánchez Osuna 2004: 94–95); his name was added by Berlandier himself on each of the watercolors made after a

preliminary sketch (cf. Berlandier 1980).

According to Tad Bennicoff, who conducted to my request a second careful review of Berlandier's "Reptiles and Amphibians" manuscripts, two drafts – if they ever existed – are presently missing: the preliminary ones (where pages are fully filled) on *Trionyx ferox* and on *Emys bicolor*. Strangely, the box turtle (*Terrapene ornata*), which is alluded to in the *Journey*, was omitted. During his research, Tad Bennicoff found three sheets with short, less than one page, accounts on *Testudo caretta*, *Testudo lutaria*, and *Testudo graeca*, three Linnean species. Each was introduced by a diagnosis copied from Linnaeus (12<sup>th</sup> edition, 1766), followed by some comments (references, range, habitat), the whole in Latin. Berlandier gave "Cerv. mss." as author of each account. He referred thus to the famous pharmacist and botanist Vicente Cervantes Mendo, born in Spain in 1755, arrived in Mexico (then Nueva España) in 1787, and died in Mexico City on 26 July 1829. There Berlandier met him, in 1827 (Berlandier 1980: 131), and they corresponded. Most probably Berlandier tried to identify the turtles and tortoises encountered in the field, but lacking appropriate references, he copied these notes from Cervantes' documents, somewhat adapted: the range of *Testudo graeca*, "Habitat in Africa" according to Linnaeus (1766: 352), was modified as "Habitat in Africa, Nova Hisp." so as to include the Mexican Tortoise. This is evidence that Berlandier showed an interest in zoology very early on and that he quickly mastered systematics. Each document in Berlandier's manuscripts in connection with turtles is listed in Table 2.

To scientifically name the turtles and tortoises, Berlandier used the vernacular term "Chéloniens," then Chelonii and Cryptopodi or Gymnopodi, these latter as families. Although Chéloniens and Chelonii dated back from Brongniart and Latreille, Berlandier most probably borrowed his nomenclature from Latreille (1825: 91–92), though Gray (1825: 210, 212) used the same names<sup>7</sup>. Cryptopodi and Gymnopodi separated the hard shelled turtles from those "with feet and head not or only partly retractile into the carapace," mostly



**FIGURE 1.** Plate VI (central part) in Berlandier's manuscript, illustration (attributed to Berlandier himself) of "*Trionyx ferox*" = *Apalone spinifer emoryi* (Agassiz, 1857). Notice the pale rim strongly broadened along the rear border of the shell, diagnostic of this subspecies, and the small whitish dots on the rear of the back, typical of juveniles and young males. Shell length ca. 96 mm on the paper, scale unknown; probably an adult male, according to the rather narrow head and the visible tip of the tail. Smithsonian Institution, Archives, Record Unit 7052, Box 12, Folder 15 (Image SIA2014-01826).

**FIGURE 1.** Planche VI (partie centrale) du manuscrit de Berlandier. Illustration (attribuée à Berlandier lui-même) de "*Trionyx ferox*" = *Apalone spinifer emoryi* (Agassiz, 1857). Noter la bordure pâle fortement élargie le long du bord postérieur de la carapace, diagnostique de cette sous-espèce, et les petits points blanchâtres à l'arrière du dos, typiques des mâles et des juvéniles. Longueur de la carapace env. 96 mm sur le papier, longueur réelle inconnue (échelle non donnée); probablement un mâle, d'après la tête relativement petite et l'extrémité de la queue bien visible. Smithsonian Institution, Archives, Record Unit 7052, Box 12, Folder 15 (Image SIA2014-01826).

soft, i.e., the sea turtles and the soft shell turtles. However, Berlandier only included the softshell turtle *Trionyx* in Gymnopodi, the sea turtle *Testudo mydas* = *Emyda viridis* was considered as



**FIGURE 2.** Plate IV (central part) in Berlandier's manuscript, illustration (attributed to Berlandier himself) of "*Emys bicolor*" = *Trachemys scripta elegans* (Wied, 1839). Notice the shape of the temporal red spot. Shell length on the paper and real (scale 1/1) ca. 100 mm. Smithsonian Institution, Archives, Record Unit 7052, Box 12, Folder 15 (Image SIA2014-01824).

**FIGURE 2.** Plate IV (partie centrale) du manuscrit de Berlandier. Illustration (attribuée à Berlandier lui-même) de "*Emys bicolor*" = *Trachemys scripta elegans* (Wied, 1839). Noter la forme de la tache temporale rougeâtre. Longueur de la carapace sur le papier et réelle (échelle 1/1) env. 100 mm. Smithsonian Institution, Archives, Record Unit 7052, Box 12, Folder 15 (Image SIA2014-01824).

being a member of the Cryptopodi, like *Emys* and *Testudo*. In each of the descriptions Berlandier planned to add a set of measures and listed the measurements to take, but only three full accounts were provided: for *Emyda viridis*, *Trionyx ferox*, and *Emys bicolor*. A partial translation (36 pages) in English of Berlandier's manuscripts on reptiles, entitled *Remarks on the habits of some of the Reptiles found along the Lower Rio Grande*, was made by a friend of Baird, Caleb Burwell Rowan Kennerly (1829-1861) from the Smithsonian Institution, between 1855 and 1857. "The original of the translation is now in the possession of Kraig Adler through the generosity of RC [Roger Conant]"



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TABLE 2. Descriptions and illustrations of turtles in Berlandier's papers, Smithsonian Institution.

Species, mentioned author	Author of manuscript	First manuscript	Final manuscript	Plate
<i>Testudo caretta</i> Linnaeus	Cervantes	1 page	–	–
<i>Testudo lutaria</i> Linnaeus	”	1 page	–	–
<i>Testudo graeca</i> Linnaeus	”	1 page	–	–
<i>Testudo mydas</i> Linnaeus, then				
<i>Emyda viridis</i> (Schneider)	Berlandier	7 pages	8 pages	–
<i>Trionyx ferox</i> [Schneider, not mentioned]	”	Not located	4 pages	Pl. VI
<i>Emys bicolor</i> Berlandier	”	Not located	4 pages	Pl. IV
<i>Testudo bicolor</i> Berlandier, then <i>Testudo minima</i> Berlandier	”	3 pages	4 pages	–
<i>Testudo tuberculata</i> Berlandier	”	3 pages	4 pages	Pl. V

(Chiszar et al. 2003). This translation remains unpublished. Other translations by Kennerly are kept in Berlandier's papers at the Smithsonian Institution.

In the preliminary draft *Testudo bicolor* is also named *T. minima*, both names that Berlandier attributed to himself (“Berl. Mss”), but then only *T. minima* appears in the final copy. This puzzling change was made in connection with the redaction of the second draft, where Berlandier used the epithet *bicolor* to name a very distinct species, *Emys bicolor*. Both description and illustration lead to recognize that the latter is the freshwater turtle currently known as *Trachemys scripta* (Schoepff 1792)<sup>8</sup>. However, in both published accounts (Berlandier 1850, 1980), based on his diary of the journey, *T. bicolor* obviously agrees with a young *Xerobates berlandieri*. In the manuscript descriptions, several details also allow one to undoubtedly recognize this species, like “écailles centrales de la carapace ... jaunâtres au centre ... 3–4 bords renflés parallèles et noirâtres ...” (central scutes of the shell yellowish ... 3–4 bulging borders parallel and blackish ...). The locality is first given as “Habite dans les grandes plaines souvent inon-

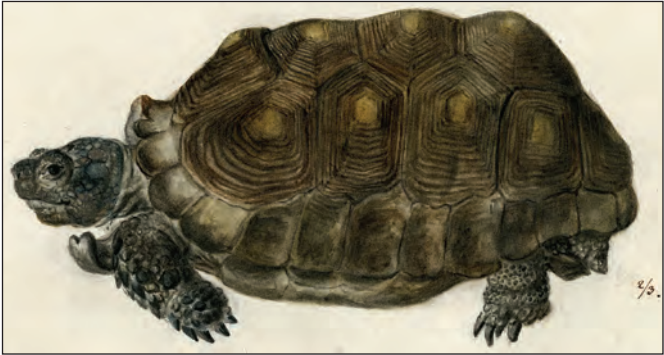


FIGURE 3. – Plate V in Berlandier's manuscript. Illustration (attributed to Berlandier himself) of *Testudo tuberculata* Berlandier, 1850, lectotype (herein designated). Apparently an old male; notice the projecting, bent upwards and notched gular scutes. Shell length on the paper ca. 134 mm, real ca. 200 mm according to the scale 2/3. Smithsonian Institution, Archives, Record Unit 7052, Box 12, Folder 15 (Image SIA2014-01825).  
FIGURE 3. – Plate V du manuscrit de Berlandier. Illustration (attribuée à Berlandier lui-même) de *Testudo tuberculata* Berlandier, 1850, lectotype (présente désignation). Noter les gulaires saillantes, échancrées, recourbées vers le haut. Longueur de la carapace sur le papier env. 134 mm, réelle env. 200 mm selon l'échelle 2/3. Smithsonian Institution, Archives, Record Unit 7052, Box 12, Folder 15 (Image SIA2014-01825).

dées qui séparent Matamoros de San Fernando de las Presas, sur les côtes du golfe du Mexique, de l'État de Tamaulipas” (Lives in large plains often flooded separating Matamoros from San Fernando de las Presas, on the coast of the Gulf of Mexico, State of Tamaulipas), then slightly modified as “Habite les grandes plaines sèches et stériles et quelquefois inondées ...” (Lives in dry and barren large plains, sometimes flooded ...).

In these accounts certainly written after the *Journey to Mexico*, *Testudo tuberculata*, like *T. bicolor* = *T. minima*, remains without any doubt the species currently known as *Gopherus berlandieri* or *Xerobates berlandieri*. The final descriptions of each nominal species are here translated *in extenso*. Differences with the first drafts are really mi-

nor; one can notice the use of Rio Grande, then of Rio Bravo. Berlandier sometime mixed ‘;’ and ‘:’; misspellings are very rare (inondé for inondé) and omitted here. Italics correspond to underlined words in the manuscript. The first page of the final text on *T. tuberculata* is reproduced as Figure 4.

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**TESTUDO BICOLOR BERLANDIER, 1850, TESTUDO MINIMA BERLANDIER MSS**

**Chelonii Cryptopodi**

*De quatre à cinq pouces au plus; écailles centrales de la carapace jaunâtres au centre, comme chagrinées avec 3-4 renflements marginaux noirâtres: le renflement intérieur est dentelé vers le centre des écailles; plastron divisé antérieurement en deux dents noires et chagrinées; postérieurement un peu bifide.*

Habite les grandes plaines sèches et stériles et quelquefois inondées qui séparent Matamoros de San Fernando de las Presas sur les côtes du Golfe du Mexique dans l'état de Tamaulipas. Cette tortue qui n'atteint jamais de grandes dimensions nous a paru herbivore et douée d'une notable agilité.

Tête de grosseur médiocre écailleuse et plane en dessus, le bout du nez est tuberculeux et les narines sont petites et ovales; yeux petits, vifs, arrondis à iris verdâtre ou violet; bouche grande représentant de chaque côté un arc dont la concavité est tournée en dessus.

Col long, couvert d'une peau lâche peu unie aux chairs, formant beaucoup de replis et assez mince.

*Corps.* Carapace bombée en dessus, ovale, avec une échancrure en avant et une autre en arrière: les 13 écailles centrales ont chacune trois ou quatre renflements noirâtres parallèles aux côtés et le renflement intérieur est dentelé avec les dents tournées vers le centre de l'écaille, celui-ci est grenu, jaunâtre et un peu noirâtre vers les renflements; les écailles marginales sont presque imbriquées car le bord postérieur des premières recouvre successivement le bord antérieur de celles qui suivent et donnent aux bords du plastron un aspect dentelé. Ces dents sont jaunâtres.

Plastron formé de 12 écailles; les quatre du centre ou intermédiaires le réunissent à la carapace et sont les plus grandes. En avant le plastron est bifide, en arrière il offre un sinus rentrant.

Extrémités peu longues; les antérieures garnies de tubercules très forts; 5 ongles forts, peu crochus allongés et grisâtres; les pattes postérieures sont moins grosses, moins tuberculeuses, couvertes d'écailles moins fortes et plus petites; 4 ongles peu crochus.

Queue fort courte, très pointue; au dessous près de sa base est l'anus.

*Testudo minima Berl. mss*

*Four to five inches at most; central scutes of the carapace with a yellowish center, slightly rough [like shagreened] with 3-4 marginal blackish bulges: the inner bulge is serrated near the center of the scutes; front of the plastron divided into two black and shagreened teeth; rear slightly forked.*

Lives in large dry and barren and sometimes flooded plains that separate Matamoros from San Fernando de las Presas on the coast of the Gulf of Mexico in the state of Tamaulipas. This turtle that never reaches large size seems to us as being herbivore and gifted with a significant agility.

Head scaly of moderate size, flat on top, the tip of the nose is slightly bulging and nostrils are small and oval; eyes small, sharp, rounded, the iris green or purple; mouth large, on each side making an arc whose concavity is turned upward.

Neck long, covered with a loose skin to poorly connected to the flesh, making many folds and rather thin.

*Body.* Upper shell domed, oval, with a notch in the front and one backward: each of the 13 central scutes have three or four parallel blackish bulges on the sides, and the inner bulge is indented with teeth facing the center of the scute; this one is grainy, yellowish and a little blackish toward the bulges; marginal scutes are almost overlapping, because the rear edge of the front one covers the front edge of the following, and successively, that gives a jagged shape to the free border of the plastron. These teeth are yellowish.

Plastron made of 12 scutes; four of the center or middle unite it to the shell and are the largest. Forward the plastron is bifurcated, backward it presents an inside sinus.

Extremities rather short; fore limbs fitted with very strong tubercles; 5 strong nails, slightly hooked, elongated and grayish; hind legs are smaller, less tuberculate, covered with weaker and smaller scales; 4 nails poorly hooked.

Tail very short, very sharp; below near its base is the anus.

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**TESTUDO TUBERCULATA BERLANDIER, 1850**

Chelonii Cryptopodi (Pl. f. V)

*Carapace plus bombée en arrière qu'en avant, couverte d'écailles brunes ou brun-noirâtres munies de divers renflements parallèles aux bords ; plastron terminé antérieurement par deux cornes très allongées et postérieurement par une ouverture angulaire ; au dessous du col deux tubercules arrondis ; pieds roux-jaunâtres tuberculeux.*

Habite les plaines de l'état de Tamaulipas entre Matamoros et San Fernando de las Presas. À Laredo sur les bords du Rio Bravo cette tortue fait un des points importants de la nourriture des militaires des presidios lorsqu'ils parcourent les déserts. Elle est herbivore.

*Tête* plane en dessus et un peu convexe vers l'occiput, écailleuse ; nez obtus, narines antérieures et arrondies ; yeux oblongs à iris violet et obscure ; col allongé, grenu à peau dépourvue d'écailles, au dessous de la mâchoire inférieure deux grands tubercules charnus.

*Corps.* *Carapace* ovale, plus déprimée en avant et plus bombée en arrière, couverte de 13 écailles centrales et 24 marginales ; toutes d'un brun clair quelquefois tachées de noir-gris.

La carapace est comprimée sur les côtés, ses bords sont relevés en avant et les écailles forment de grandes dents obtuses tandis que la partie postérieure d'abord évasée sur les côtés elle se prolonge en dessous. Les écailles centrales sont couvertes de renflements parallèles aux bords qui sembleraient faire croire que chaque écaille est un composé de plusieurs autres de plus en plus petites et superposées : le centre de chaque écaille est lisse, roussâtre et un peu convexe. Les écailles marginales sont très épaisses et grandes : celle de la partie antérieure est petite, représentant une dent échancrée en avant.

*Plastron* : il est extrêmement convexe dans les males ; les deux écailles postérieures laissent une échancrure cunéiforme pour faciliter l'issue des excréments, et comme elles sont beaucoup plus saillantes que les autres sur elles repose toute la partie postérieure du corps ; en avant les deux écailles antérieures se prolongent en espèces de cornes, unies dans toute leur longueur excepté à leurs extrémités et recourbées en dessus servant de support à la tête qui dépasse de beaucoup le plastron.

*Extrémités* : les antérieures plus longues que les postérieures, couvertes d'écailles tuberculeuses en avant, l'avant-bras est comprimé, les ongles forts, presque coniques, courts et obtus. Les postérieures représentent une masse difforme, sont jaunâtres ou simplement couleur de chair un peu moins recouvertes de tubercules écailleux, n'ayant aucun doigt distinct, et les ongles au nombre de quatre semblent sortis d'une masse cylindrique tronquée à sa base.

*Queue* courte, jaunâtre ou couleur de chair, tuberculeuse et terminée en pointe.

N. Entre les deux yeux au dessus de la tête une tache jaunâtre ainsi que deux autres en arrière des yeux.

*Testudo tuberculata Berl. mss.*

*Shell more bulged backward than in front, covered with brown or blackish-brown scales, fitted with various protrusions parallel to the edges; plastron anteriorly ending by two very elongated horns, and posteriorly by an angular aperture; under the neck two rounded tubercles; feet yellowish-rufous, tuberculate.*

Inhabits the plains of the state of Tamaulipas between Matamoros and San Fernando de las Presas. At Laredo on the banks of the Rio Bravo this tortoise is one of the important items of the presidios troopers' food when crossing deserts. It is herbivorous.

*Head* flat above and slightly convex towards the occiput, scaly; blunt nose, rounded nostrils set forward, eyes oblong with a dark purple iris; neck elongate, its skin grainy without scales, below the lower jaw two big fleshy tubercles.

*Body.* *Carapace* oval, more depressed forward and more arched backward, covered with 13 central and 24 marginal scutes; all light brown sometimes stained dark gray.

The carapace is compressed on the sides, its edges are raised in the front and the scales make large obtuse teeth whereas the rear portion first broadens then grows longer underneath. Central scutes are covered with protrusions parallel to the edges which seem to suggest that each scute is a composite of several other smaller and smaller, and superimposed: the center of each scute is smooth, buff-colored and slightly convex. Marginal scutes are large and very thick: that of the anterior part is small, making a tooth notched forward.

*Plastron*: it is extremely convex in males; the two posterior scutes leave a wedge-shaped notch to facilitate the voiding, and because they are much more prominent than the other the whole posterior part of the body leans on them; the two anterior scutes protrude like horns, united in their entire length except at their ends and curved upward for supporting the head which by far exceeds the plastron.

*Extremities*: fore limbs longer than hind, covered forward with tuberculate scales, the forearm is compressed, nails strong, almost conical, short and obtuse. Hind limbs look like a shapeless mass, yellowish or merely flesh color, a little less covered with scaly tubercles, having no separate finger, and nails four in number seeming to appear out of a cylindrical mass truncated at its base.

*Tail* short, yellowish or flesh-colored, tuberculate and tapering.

N. Above the head between the eyes a yellowish spot and two other behind the eyes.



Berlandier's plate V covers a sheet of 22 x 31 cm. An adult tortoise, probably a male, is depicted in lateral view, its shell length being ca. 134 mm (without the projecting gulars) on the paper (Figure 3). If the scale is really 2/3 as specified, the straight-line carapacial length would have been ca. 200 mm, which is a little under the maximal recorded length of just under 220 mm (Auffenberg and Weaver 1969: 168–169)<sup>9</sup>, and up to 228 mm according to Ernst and Lovitch (2009: 571), and Bramble and Hutchison (2014: 4). I hereby designate the depicted specimen as being the lectotype of *Testudo tuberculata* Berlandier, 1850; this specimen is presently unlocatable. The type locality is written on the plate: “in campis prope Matamoros urbem,” i.e., in plains near the city of Matamoros.

## MATERIAL

It can be assumed that at least some of Berlandier's specimens of turtles that were studied by Agassiz are presently identified, and Roy McDiarmid, James Poindexter and their staff must be thanked for providing excellent photographs of all known specimens in the collections of the National Museum of Natural History. The material registered as belonging to the type series of *Xerobates berlandieri* includes:

(1) A shell with limbs, plastron separated, of an adult female (shell length ca. 160 mm); the skull was extracted. The whole is registered as USNM 222511; tags and a hand-written indication on the carapace indicate “Monterrey, Mex.” and a former No 8601 (osteological collections). It probably agrees with the specimen No. 85 of Baird's listing (Table 1), although it could also be No. 75 (from “New Leon”). In the online catalogue (<http://collections.nmnh.si.edu/search/herps/>), the locality of the specimen is specified as Mexico, Nuevo León. The shell is depicted in Figure 5, the skull in Figure 6.

(2) A skull alone, incomplete, registered as USNM 222512, formerly 1528 and 29610 (osteological collections), from Matamoros. It is therefore specimen No. 1528 in Baird's listing. In the online catalogue, the locality is specified Mexico,

Tamaulipas. According to the same catalogue, this entry also includes “shell and partial postcranial skeleton.”

(3 and 4) Two young in alcohol (ethanol), registered together as USNM 60. The larger, USNM 60 (1), is about 72 mm (shell length), it bears an earlier No. 10. One of these specimens could be the No. 59 of Baird's listing, the other having kept his original No. The smaller, USNM 60 (2), about 41 mm long, is a hatchling, or at least close to that developmental stage. They are shown in Figures 7 and 8 respectively. The shell of the latter is slightly distorted, but a peculiar abnormality on the third vertebral scute (V3) allows to state that without doubt it is the very specimen illustrated by Agassiz in the original description (Figure 9); furthermore, the dimensions fully agree, 41 x 41 mm, the figure being at natural size (Agassiz 1857b: 623; Auffenberg and Weaver 1969: 166). In the online catalogue, the locality is specified as United States, Texas, Lower Rio Grande, like on Baird's list. Only one specimen on Baird's list, possibly No. 75, from Nuevo León, is presently unlocated.

Actually, if these four specimens can be confidently considered as syntypes of *X. berlandieri*, the identity of the collector is mainly based on Agassiz's statement about the “zealous French naturalist.” It is quite possible that Couch, who himself had interest in natural history and also gathered specimens, including “quadrepeds” (Lawson 2012: 5), also collected tortoises. Agassiz, besides mentioning Berlandier as collector, was quite vague about the origin of the specimens, just giving “This species ... is limited to southern Texas and Mexico.” However, he did know three localities, as shown above: Lower Rio Grande, Texas; Monterrey, Nuevo León; Matamoros, Tamaulipas. Aware of these localities, either from the files or from the tags, L. Stejneger and T. Barbour (1917: 121) formally gave “Lower Rio Grande, Texas” as type locality; Karl P. Schmidt (1953: 105) specified “Brownsville, Cameron County, Texas,” without noting that it was a restriction. Mertens and Wermuth (1955: 371) kept this as type locality (*terra typica*), and King and Burke (1989: 82) added “restricted to,” both ac-

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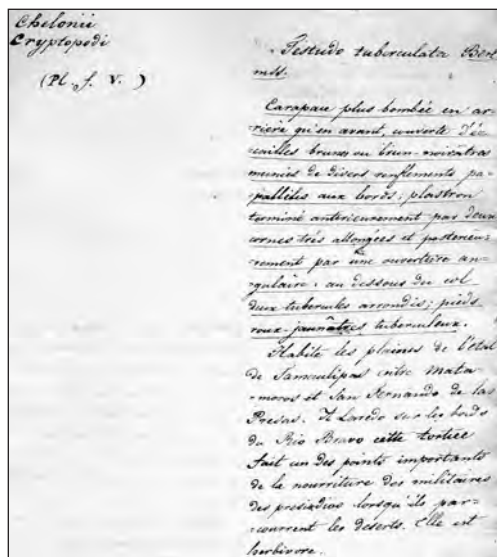
counts referring to Schmidt (1953). This was regularly repeated until Fritz and Havaš (2007: 280). Actually, the restriction was first made by Smith and Taylor (1950: 28): "Type locality. – Lower Rio Grande, Tex., here restricted to Brownsville." Brownsville faces Matamoros, on the opposite bank of the Rio Grande. No lectotype designation was published; Iverson (1986: 149) then King and Burke (1989: 82) each mentioned only two syntypes, registered together as USNM 60 (cf. above). Specimen USNM 60 (2) (Figure 8), pictured in the original description (Figure 9), is hereby designated as the lectotype of *Xerobates berlandieri* Agassiz, 1857.

## CONCLUSION

In conclusion, *Testudo tuberculata* and *T. bicolor*, although first described by Berlandier himself in 1850, must be considered as names essentially lost to science, i.e., *nomina oblita*. There is nonetheless some historical justice in the fact that the current scientific name, credited to Agassiz, recognizes the true first describer and collector of this distinctive tortoise. We must also acknowledge that we owe both the type specimens and the name of Berlandier's tortoise to Baird's efforts and gratefulness.

## ACKNOWLEDGEMENTS

For the research and reproduction of Berlandier's manuscripts and drawings I thank Tad Benicoff and the Archives department, and Roy W. McDiarmid, James Poindexter and the Herpetological department, all at the Smithsonian Institution, U.S. National Museum of Natural History, Washington DC for sending a large set of pictures of the type material of *Xerobates berlandieri*. Without their help this paper could not exist. Tad spent a lot of time to look for the pertinent manuscripts in the bulk of Berlandier's papers and to answer to my always demanding requests. My gratitude is also for the editorial team of *Bibliotheca Herpetologica*, including Richard Wahlgren (Chairperson), Aaron Bauer, Markus Lambertz, and Ralph Tramontano. Markus and one anonymous reviewer made a tremendous work to finalize the manuscript. Lastly I thank two colleagues and

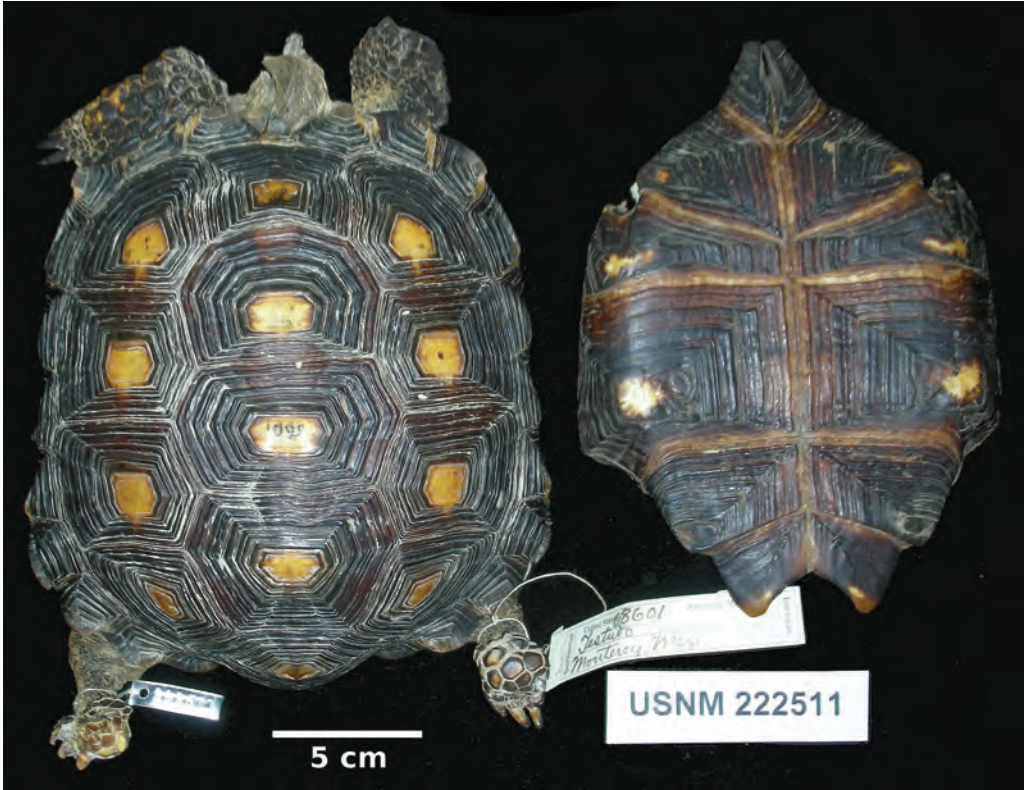


**FIGURE 4.** – First page of the description of *Testudo tuberculata* by Berlandier (final manuscript). Smithsonian Institution, Archives, Record Unit 7052, Box 9, Folder 1.  
**FIGURE 4.** – Première page de la description de *Testudo tuberculata* by Berlandier (manuscrit final). Smithsonian Institution, Archives, Record Unit 7052, Box 9, Folder 1.

friends, John B. Iverson for his expertise and open-mindedness about the names of turtles, just as his review and correction of a previous draft, and Kraig Adler for his continuous interest and communication of various bibliographical references.

## NOTES

1. Agassiz (1857a: 392, note 1) published the name *Xerobates berlandieri* without diagnosis, but referring to pl. '5' [=3], fig. 17–19 (actually published in Agassiz 1857b). Fritz and Havaš (2007: 280) indicate this latter reference as being the original publication.
2. *Gopherus berlandieri* (Agassiz, 1857), *Kinosternon flavescens* (Agassiz, 1857), and *Terrapene ornata* (Agassiz, 1857), respectively. It is to be stressed here that in his own publication, Agassiz completely changed the nomenclature of these turtles: *Xerobates carolinus* instead of *Testudo polyphemus*, *Platythyra* for *Kinosternon*, *Cistudo* for *Terrapene*.
3. It should be remembered here that Berlandier, born on 1 August 1803 in Geneva, died on 22 April 1851 drowning in the Rio San Fernando, when crossing it at the locality of the same name. Berlandier went to Mexico



**FIGURE 5.** Shell (carapace and plastron) of the specimen USNM 222511. Shell length ca. 160 mm. Syntype of *Xerobates berlandieri* Agassiz, 1857, an adult female from Monterrey, Nuevo León, Mexico. The skull was extracted. Smithsonian Institution, National Museum of Natural History, Herpetology.

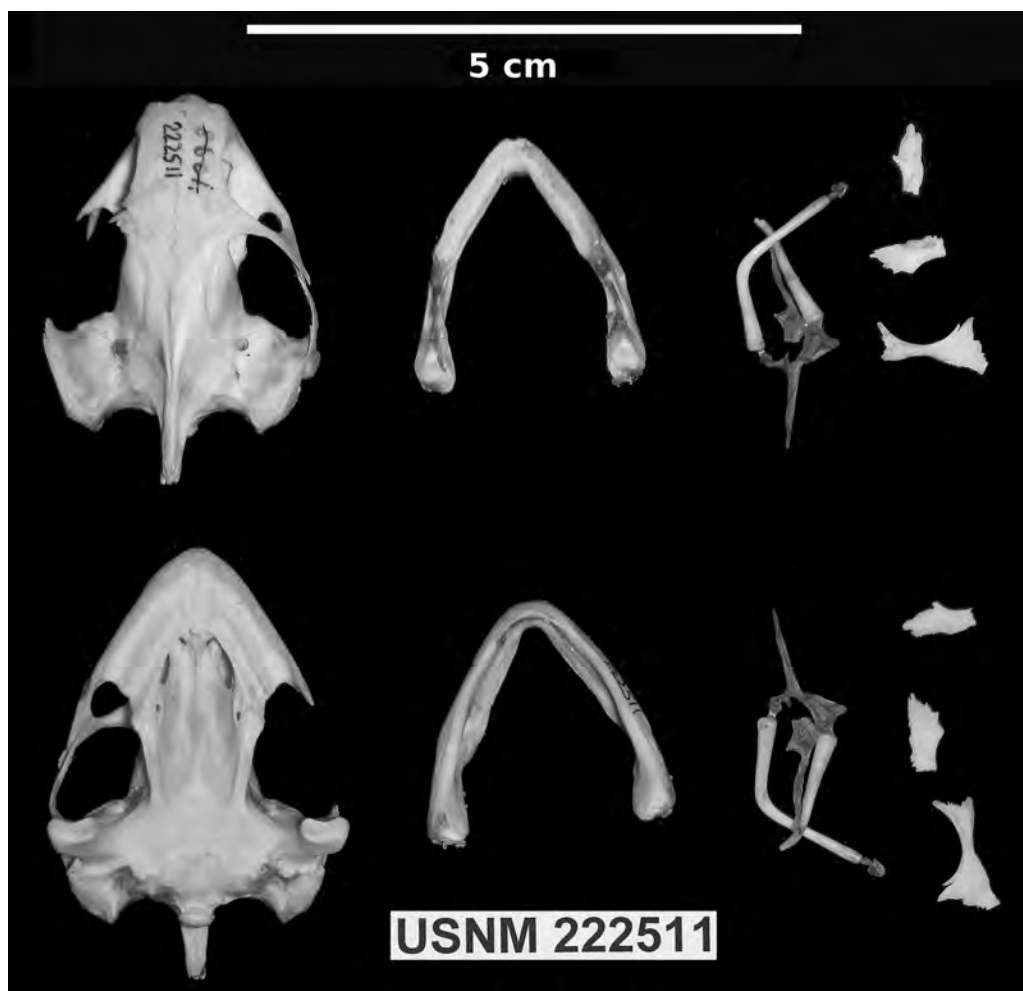
**FIGURE 5.** Carapace (dossière et plastron) du spécimen USNM 222511. Longueur de la carapace env. 160 mm. Syntype de *Xerobates berlandieri* Agassiz, 1857, femelle adulte de Monterrey, Nuevo León, Mexico. Le crâne a été extrait. Smithsonian Institution, National Museum of Natural History, Herpetology.

- City for the first time in 1827; his aim was perhaps to meet General Mariano Arista (1802–1855), new President of Mexico since January 15, whom he knew personally, perhaps also to negotiate his collections.
4. Baird really had the desire to honor the memory of the naturalist, and he himself dedicated three species of mammals to Berlandier (*Sigmodon berlandieri* Baird, 1855, Cricetidae; *Taxidea berlandieri* Baird, 1857, Mustelidae; *Blarina berlandieri* Baird, 1857, Soricidae), one bird (*Thryothorus berlandieri* Baird, 1858, Troglodytidae), and one frog (*Rana berlandieri* Baird, 1859, Ranidae).
  5. *Testudo tuberculatu*, *Testudo tuberculata* and *Testudo bicolor* are included in the synonymy of *Gopherus berlandieri* in the 7th edition of the *Turtles of the World Checklist* (van Dijk et al. 2014: 399).
  6. From a polished version. Berlandier first wrote a diary, day by day; an extract, *Diario del viaje de Luis Berlandier*, from 19 November 1828, was pub-

lished in a Mexico City paper, the *Registro Oficial*, in several installments starting on 26 January 1831 (Jackson in Mier y Terán 2000: 22). Probably the same diary was published as a little book entitled *Viage a Texas en el Año 1828*, edited by Vargas Rea (Berlandier 1948); in the latter, the editor specifies “De los papeles del general Terán, que existen en el Archivo General de la Nación, tomamos para su publicación este fragmento [sic] de un Diario de Viajes, en el año de 1828.” The account begins on 10 November 1827 and at first agrees well with Volume III Chapter 1 and following of the *Journey to Mexico* (Berlandier 1980: 180 et sqq.), then there are many cuts. The diary ends on 18 December 1828, where Berlandier’s signature, as author, appears for the first and last time.

7. Latreille dated his preface 20 October 1824, and the work was published few months later, before June 1825 according to Geoffroy Saint-Hilaire (1825)





**FIGURE 6.** Skull of the specimen USNM 222511. Condilo-basal length ca. 34 mm. Syntype of *Xerobates berlandieri* Agassiz, 1857, an adult female from Monterrey, Nuevo León, Mexico. Dorsal (above) and ventral view. From left to right, skull, lower jaw, hyoid apparatus, bones of the left cheek (postorbital, jugal, and quadratojugal). Smithsonian Institution, National Museum of Natural History, Herpetology.

**FIGURE 6.** Crâne du spécimen USNM 222511. Longueur condylo-basale env. 34 mm. Syntype de *Xerobates berlandieri* Agassiz, 1857, femelle adulte de Monterrey, Nuevo León, Mexico. Vue dorsale (en haut) et ventrale. De gauche à droite, crâne, mandibule, appareil hyoïdien, os de la joue gauche (postorbitaire, jugal, quadratojugal). Smithsonian Institution, National Museum of Natural History, Herpetology.

and Virey (1825). The fascicle of the *Annals of Philosophy* containing Gray's well known paper was published in September 1825. Latreille (1825:10) clearly claimed to be the author of the "coupe" (splitting) in *Chelonii*.

8. Precisely *T. s. elegans* (Wied, 1839) according to the current taxonomy. However at least some specimens from the lower Rio Grande drainage can be distinguished from the typical populations by a widened reddish temporal marking, which is abruptly sepa-

rated from both a small rounded red dot close to the rear border of the eye and from the yellowish continuation extending backward on the neck (cf. e.g. Vetter 2004: 94). This character was also noticed on site by John Iverson (com. pers., 11 March 2014). A detailed description of the postorbital marks in this population of *T. s. elegans*, with percentages of occurrence and a hypothesis about intermediacy was recently published by Legler and Vogt (2013: 255); this pattern occurs in 59% of specimens along the



**FIGURE 7.** Specimen USNM 60 (1). Shell length ca. 72 mm. Juvenile in ethanol, syntype of *Xerobates berlandieri* Agassiz, 1857, from Texas (?). Most of the dorsal scutes are detached. Smithsonian Institution, National Museum of Natural History, Herpetology.

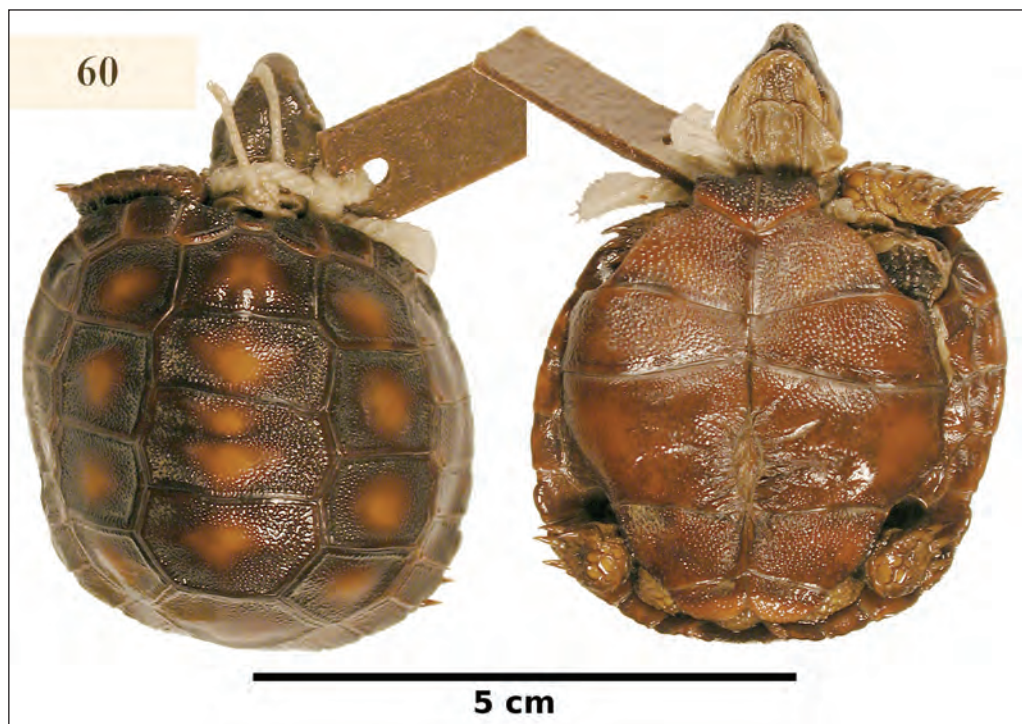
**FIGURE 7.** Spécimen USNM 60 (1). Longueur de la carapace env. 72 mm. Juvénile en alcool. Syntype de *Xerobates berlandieri* Agassiz, 1857, du Texas (?). La plupart des écailles dorsales sont détachées. Smithsonian Institution, National Museum of Natural History, Herpetology.

lower Rio Grande, between McAllen and Matamoros. Berlandier's pictured specimen clearly presents a wide red blotch well separated from the eye by light lines and a much smaller isolated red spot (cf. Figure 2).

9. Auffenberg (1966: 170) had previously mentioned a specimen with a carapace length of 314 mm, but that is certainly a misprint.

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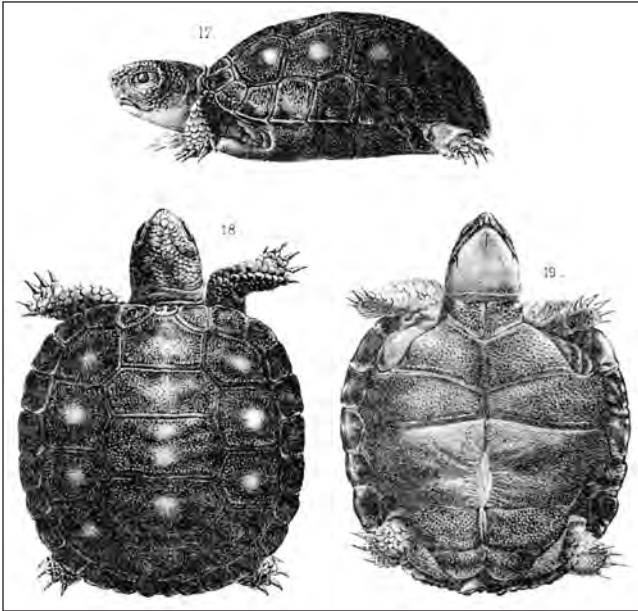


**FIGURE 8.** Specimen USNM 60 (2). Shell length ca. 41 mm. A hatchling in ethanol, syntype of *Xerobates berlandieri* Agassiz, 1857, from Texas (?). This specimen is depicted in the original description and herein designated as the lectotype for this species. Smithsonian Institution, National Museum of Natural History, Herpetology.

**FIGURE 8.** Spécimen USNM 60 (2). Longueur de la carapace env. 41 mm. Nouveau-né en alcool. Syntype of *Xerobates berlandieri* Agassiz, 1857, du Texas (?). Ce spécimen est figuré dans la description originale (Agassiz 1854b) et désigné ici comme lectotype. Smithsonian Institution, National Museum of Natural History, Herpetology.

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**FIGURE 9.** Specimen pictured on figure 8, USNM 60 (2). Shell length ca. 41 mm. Lithograph made at natural size by Antoine Sonrel, from a drawing of Jacques Burkhardt. Illustrated in Agassiz (1857b: pl. 3, fig. 17–19).

**FIGURE 9.** Spécimen représenté sur la figure 8, USNM 60 (2). Longueur de la carapace env. 41 mm. Lithographie d'Antoine Sonrel, d'après un dessin de Jacques Burkhardt; grandeur naturelle. Illustration dans Agassiz (1857b: planche 3, figures 17 à 19).

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#### WEB RESOURCE

The catalogue of “Jean Louis Berlandier Papers, 1826–1851, and related papers to 1886” in the Smithsonian Institution Archives can be consulted at: [https://siarchives.si.edu/collections/siris\\_arc\\_217211?back=/search/sia\\_search\\_findingaids/Berlandier](https://siarchives.si.edu/collections/siris_arc_217211?back=/search/sia_search_findingaids/Berlandier)



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